

THE SHELLS OF THE TRES MARIAS AND OTHER LOCALITIES ALONG THE SHORES OF LOWER CALIFORNIA AND THE GULF OF CALIFORNIA.

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IN THE spring of 1876, Mr. W. J. Fisher, of San Francisco, who had previously, in 1873, been connected as Naturalist with the U. S. S. *Tuscarora* Telegraph Sounding Expedition, under Commander George E. Belknap, conceived the idea of chartering or purchasing a small vessel and making an investigation of the shores and islands of Lower California and the Gulf of California in the interest of natural history. Through the generosity of Mr. Fisher, the greater part of the mollusks collected by him were given to me, and became a part of the Stearns Collection, now incorporated into the greater collection of the U. S. National Museum.

Mr. Fisher's collection, though made, as it will be seen, many years ago, has not heretofore been brought to notice. Notwithstanding this lapse of time, its value, through the importance of the information it furnishes on the geographical distribution of most of the species enumerated, has not been impaired by delay in publication, as no subsequent collector has touched at or visited so many localities around the shores of the Gulf and of Lower California, or if any such collection has been made it has not been made known. Many of the localities have not previously been mentioned, either by collectors or authors. The importance of Mr. Fisher's collection, in its bearing upon the Mollusca of the Tres Marias, is worthy of special mention; it would of itself justify the publication of the list, for it exhibits more fully the mollusk-fauna of this interesting and little-known group of islands, and includes a greater number of species than any and all previous publications. Aside from the few new species that he collected, much light was obtained as to others that may be regarded as rare or little known, and again, the detection of so many familiar forms, heretofore associated in our minds with Indo-Pacific or rather Polynesian waters, is almost a revelation and of exceeding interest. There are no currents setting eastward from

the Pacific that might possibly transport drift material from the regions where these species are known to live, and thus convey and enable them to make a lodgment or gain a foothold on the western coast of the continent. In the gulf region the currents sweep in the opposite direction, that is, to the westward. It is possible that these exotic forms have been introduced as an incident of commerce.

For many years vessels seeking a return cargo from various places in Indo-Pacific waters have visited the gulf region, especially the Tres Marias islands, for the dyewoods that are found there, and which at various periods have furnished quite a large business to vessels seeking return freights. Vessels bound to the gulf ports in such cases would be in ballast, and if from Indo-Pacific regions the ballast would, it is probable, consist in the main of coral blocks or fragments of reef-rock, the chinks of which ordinarily furnish a hiding place for molluscan species, and other small forms of marine life. Upon arriving at the port or embarcadero before loading, the ballast would be dumped overboard, and with it such animals, living or dead, as were secreted among, attached to, or contained in it. The Tres Marias and Altata are well known loading places for the dyewoods trade; the latter being an embarcadero for interior regions, where the dyewoods are cut. In one instance I collected several specimens of *Orthalicus undatus* and a species of *Bulinulus* that had concealed themselves among the dyewood and were transported with it to San Francisco. Upon discharging the cargo, in throwing the freight ashore, the snails were jarred out. Some of them were picked up on the wharf and others in the hold of the vessel after the cargo was discharged.

Besides the dyewoods, salt from the Carmen Island works and orchilla furnish export cargoes in whole or in part. The extent of the traffic in these Mexican exports varies very much one year or period compared with another. At the time of the Franco-Mexican war, or rather the invasion of Mexico by the French, the commerce of the gulf was greatly increased. It was during this period that large and important additions were made to the Stearns Collection, through arrangements made with parties employed in the coastwise trade between California and west Mexican ports. No such opportunity for obtaining the shells of the gulf region has occurred since, nor is likely to for many years. In addition to the collection made by Mr. Fisher, I have, in a few instances, added to the list localities visited by other friends and the species collected by them. In this connection, the names of Capt. A. Forrer, of Dr. William M. Gabb, whose collections, made at San Juanico and Loreto, Lower California, in February, 1867, were published by me in 1873,* and the late Henry Edwards, well known as an excellent actor and in scientific circles as an accomplished entomologist and writer on entomological subjects, who contributed a few species that were found by him at Mazatlan and vicinity in 1873, appear occasion-

* Proc. Cal. Acad. Sciences, July, 1872.

ally, and the names of other friends—Mr. J. W. Towne, of San Francisco, Samuel Pillsbury, Henry W. Henshaw, and Henry Hemphill occur. The latter, as well as Mr. L. Belding, of California, and Dr. Edward Palmer, have added many species and examples of interest and importance to the national collection.

All of the species credited to San Juanico, on the outer coast of the peninsula, and Loreto were collected by Dr. Gabb. All of those referred to Altata were presented by Mr. A. J. Gove, of San Francisco, who received them directly from the parties who collected them at the locality stated. With a few exceptions, all of the species herein listed are contained in the National Museum, having formed a part of the Stearns Collection. This list is, however, not quite complete. There are several species, notably of *Chitons*, not yet determined, that should be added, and doubtless a few small species may ultimately be found in the general collection that were collected by Mr. Fisher and have been overlooked, for the department of mollusks in the National Museum has reached such vast proportions, the registered numbers already exceeding 126,000 trays, that omissions are likely to occur in a paper of this character, through want of time to make a critical examination and revision.

The latitude and longitude of the various localities referred to are given below, commencing at the Coronado Islands, the most northerly on the ocean side, off the peninsula of Lower California, and proceeding southerly to Cape St. Lucas; thence northerly along the western shore of the Gulf of California, including the islands; thence along the eastern shore of the gulf, following the same and the mainland along the Mexican coast to the last or most southerly locality, Acapulco, in latitude $16^{\circ} 55'$.

In my lists of the shells collected at San Juanico and Loreto by Dr. Gabb, heretofore mentioned, I referred to San Juanico as being "on the east side of the peninsula of Lower California in latitude 27° north." This was an error occasioned by my following the localities as given in Prof. C. B. Adams' list of the "Shells of Panama;" and due no doubt to the fact of there being two places, one on each side of the peninsula of the same name. To prevent mistakes, I have listed the San Juanico of the eastern side as Point San Juanico (see San Juanico Cove). In connection with Boca de los Piedras, frequently referred to, see Estera de los Piedras in the list of localities.

Delays due to various causes have enabled me to add the collections made by the *Albatross* naturalists, Prof. Leslie A. Lee and his assistants, in 1887-'88 at Ballenas and Pichilique bays, etc., so far as the same have been worked up at this date.

Several species of land shells inhabiting the Gulf region are included in this paper; for further information, relating to those of Lower California more particularly, attention is called to Dr. Cooper's three papers "On Land and Fresh-water Mollusca of Lower California," in Vol. III of

the Proc. Calif. Acad. Sciences, also an article in *Zoe*, April, 1892, and to the more recent paper by Mr. Dall on the "Land Shells of the Genus *Balimulus* in Lower California," etc.

In this connection see the titles of various publications at the close of this paper.

Localities.

Lower California, western or ocean shore from vicinity of San Diego to Cape St. Lucas:

Locality.	Lat. N.	Long. W.
	° ' "	° ' "
Coronado Islands	32 25	117 15
Todos Santos Bay	31 50	116 40
San Tomas	31 33	116 42
San Quentin Bay	30 24	115 55
Guadeloupe Island	29 00	118 20
Cerros or Cedros Island	28 10	115 15
Assuncion Island	27 06	114 18
Ballenas Bay	26 45	113 25
San Juanico	26 04	112 17
Santa Maria Bay	24 45	112 13
Magdalena Bay	24 35	112 00
Margarita Bay	24 25	111 40
Cape St. Lucas	22 52	109 55

Lower California, gulf side of peninsula and islands, from Cape St. Lucas northerly.

Locality.	Lat. N.	Long. W.
	° ' "	° ' "
La Paz	24 10	110 20
Pichilique Island	24 16	110 21
San Josef Island	25 00	110 40
Port Escondido	25 49	111 19
Loreto	26 00	111 21
Carmen Island	26 00	111 09
San Bruno	26 12	111 23
San Juanico Cove	26 22	111 26
Mulege Bay (anchorage)	26 54	111 58
San Lucas Cove	27 12	112 13
San Marcos Island	27 13	112 05
San Carlos Bay	27 51	112 47
San Juan Bay	28 02	112 49
San Francisquita Bay	28 26	112 53
Los Animas Bay	28 50	113 20
Angeles Bay	28 55	113 32
Puerto Refugio north end of Angel de la		
Guardia Island	29 33	113 34
San Luis Island	29 58	114 25

Gulf of California, eastern or main shore, and islands southerly to Acapulco on the Pacific Ocean.

Locality.	Lat. N.	Long. W.
	° ' "	° ' "
Gnaymas	27 55	110 53
River Yaqui, mouth	27 37	119 40
Estero de los Piedras	25 50	109 25
Altata	24 38	107 57
Mazatlan	23 11	106 26
San Blas	22 50	105 30
Tres Marias	21 25	106 25
Manzanillo	19 00	104 30
Socorro Island	18 48	111 00
Acapulco	16 55	100 00

The islands constituting the Tres Marias group are known as the Maria Madre, the San Juanita, the Maria Magdalene, and the Maria Cleofas, the Maria Madre being the largest. They are situated due west of San Blas, and "consist of stratified rocks," separated from the mainland "by a flat of not more than * thirty fathoms" in depth.

All or nearly all of the forms credited to this group are from Maria Madre; or if collected upon the others, the fact has not been stated by Fisher, or the other collectors as far as I am aware.

Of Socorro, the principal island of the more distant Revilla-Gigedo group, we know but little or nothing. It was visited several years ago by Grayson, the ornithologist. The few marine shells that have been brought from there, are as would be supposed, familiar gulf forms. Of the land shells nothing is known. These islands are situated in comparatively deep water, according to the *Albatross*, soundings from 1,500 to 1,800 fathoms.

Class PELECYPODA.

Family OSTREIDÆ.

OSTREA PALMULA, Carpenter.

Rare (No. 74809, U. S. N. M.). Pond's Island southern point of Angeles Island, Gulf of California, Fisher; La Paz A. Forrer.

This species is number 357 in Carpenter's Check-list of the Smithsonian Institution, and in the "Mazatlan Mollusca," number "214 b: *Ostrea?? conchaphila*, var. *palmula*."

Judging from Carpenter's description in his Mazatlan shells, the Fisher and Forrer examples belong to his species. The specimen before me is much larger than the measurement given by Carpenter, and the proportions are not the same; as oysters vary so much in this respect, the individuals of one colony compared with the individuals of another, this discrepancy may be allowed to pass without further comment.

The chief example (Fisher's) measures 3.56 by 3.48 inches, a fine specimen.

The Forrer specimen which is a thick, solid shell shows 2 inches in greatest length by $1\frac{1}{4}$ inches in width.

Carpenter gives the proportions and size of his type, as "long. 2.3, lat. 1.6 [height]." He says "remarkable for the palmated foliations on the outer margin. * * * and for the row of denticles within this limb and within the nacreous border, fitting into corresponding depressions in the other valve." The palmated foliations radiate from just beneath the cartilage in the under or lower valve to the margin. In the upper valve these radiating ribs commence at a point about one-third of the distance from the umbo; perhaps in a large number of examples, some might exhibit this character as extending to the umbos.

* A. Agassiz.

In the specimen before me, which resembles a large *Plicatula*, there are from 19 to 20 of these ribs; these are sharply angulated and interlock closely at the margin of the valves. For an oyster this is a well marked species; it suggests Hanley's *Ostrea megadon*.

Family ANOMIIDÆ.

PLACUNANOMIA CUMINGII, Broderip.

One perfect example.

Off Lower California, at Station 2827; shelly bottom, in 10 fathoms; *Albatross*.

Family SPONDYLIDÆ.

SPONDYLUS PRINCEPS, Broderip.

Several examples, and odd valves.

Pichilingue Bay; also at Station 2828, off Lower California, in 10 fathoms; *Albatross*. The various colors exhibited by the shells of this beautiful species are included in the collections at above places.

Family PECTENIDÆ.

PECTEN SUBNODOSUS, Sowerby.

Loreto; Scammon's Lagoon (No. 105625, U. S. N. M.), Hemphill; Carmen Island (No. 63647, U. S. N. M.), Towne. Examples of this fine, though not very rare species, frequently occur, that are neither nodose or subnodose. Hemphill found it living on mud flats.

Pichilingue Bay (two odd valves), *Albatross*; also at Station 2827 (No. 102091, U. S. N. M.) and Station 2826, 10 fathoms (No. 102088, U. S. N. M.); in 9½ fathoms, off Lower California.

PECTEN VENTRICOSUS, Sowerby.

Several examples.

Pichilingue Bay, one good specimen, beach; Sta. Margarita Island (one valve); Station 2828, 10 fathoms, off Lower California; all *Albatross*.

PECTEN (JANIRA) DENTATA, Sowerby.

Several examples.

San Juanico; St. Luis Bay; Guaymas, Palmer (No. 12508, U. S. N. M.), Ballenas Bay (concave valve), and one good specimen at Station 2828, off Lower California, in 10 fathoms; *Albatross*.

Family AVICULIDÆ.

AVICULA PERUVIANA, Reeve.

One pair valves; beach. Sta. Margarita Island.

MARGARITIPHORA FIMBRIATA, Dunker.

Valves only.

Pichilique Bay; Station 2828, 10 fathoms, off Lower California; *Albatross*.

PERNA JANUS, Carpenter.

Several examples.

La Paz, both Fisher and Forrer (No. 73560, U. S. N. M.).

I have three well-marked specimens before me, which agree with Dr. Carpenter's description in the Mazatlan catalogue, pp. 151, 152. The description says: "The sculpture of the valves, of which the under is smooth, the upper ornamented with fine, radiating striae, etc.;" two of the specimens, however, show the radiating striae on both valves. Carpenter gives the measurement of his "the largest, long. (the diagonal of the lozenge) 1.12; lat. 0.68, etc." inch.

My largest example (Fisher's) measured in the same way, gives the following: Length, 2.25; breadth, 1.20 inch.

PERNA JANUS, Carpenter; variety.

Two examples. La Paz (No. 73561, U. S. N. M.), Forrer.

This is an interesting intermediate form, which unites in the individual before me the characters of Dr. Carpenter's *Janus* and Orbigny's *Chemnitzianum*. The greater portion of the exterior, exhibits the coarse, laminated growth of the latter generally exhibited in the species, and is posteriorly produced and elongated as is common in said form. The later growth, however, shows on the edge of the posterior side near the dorsal line, as well as on the anterior side, towards and extending to the ventral margin, the radiating striae, which Carpenter refers to as a characteristic of *P. Janus*. The specimen is foot or hatchet-shaped, and measures 1.12 inches in length, 1.61 inches in breadth.

PERNA CHEMNITZIANA, Orbigny.

Several specimens.

Pichilique Bay (one good example); Station 2828, off Lower California, in 10 fathoms (No. 102098, U. S. N. M.); *Albatross*.

Family MYTILIDÆ.

MYTILUS MULTIFORMIS, Carpenter.

Several specimens. Tres Marias (No. 41623, U. S. N. M.).

SEPTIFER CUMINGIANUS, Dunker.

Station 2827, 10 fathoms shelly bottom off Lower California, *Albatross*.
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tross (No. 102104, U. S. N. M.). The specimen was attached to a *Placunanomia* valve.

MODIOLA CAPAX, Conrad.

One example.

La Paz, Forrer. Sta. Margarita Island (fragment), *Albatross*.

The late J. A. McNeil, so well known for the archaeological material collected by him in Chiriqui, etc., obtained the above species in the Bay of Fonseca.

MODIOLA BRAZILIENSIS, Chemnitz.

Two examples.

La Paz, Forrer (No. 63706, U. S. N. M.); Hemphill has carried the distribution much farther to the north, having collected it in San Ignacio Lagoon (No. 105601, U. S. N. M.). Dr. Edward Palmer found it quite abundant near Guaymas, and the late J. A. McNeil obtained beautiful clean examples at the more southerly locality of the Bay of Fonseca (No. 63705, U. S. N. M.). It is a well marked species.

LITHOPHAGUS? ARISTATUS, Solander.

Two examples.

Burrowing in *Spondylus princeps*, Station 2828, 10 fathoms off Lower California, also fragments Sta. Margarita Island; *Albatross*.

Family ARCIDÆ.

ARCA PACIFICA, Sowerby.

One specimen. San Juanico.

ARCA (SCAPHARCA) LABIATA, Sowerby.

Several specimens. Animas Bay (No. 41604, U. S. N. M.).

This pretty species is represented in the Fisher collection by numerous examples, all fresh and perfect; its geographical range extends from Peru to the above locality, the most northerly thus far reported. Gabb collected it at Loreto (No. 74836, U. S. N. M.), and Bridges detected it at San Juan del Sur, in Nicaragua (No. 74837, U. S. N. M.).

ARCA (SCAPHARCA) TUBERCULOSA, Sowerby.

Two specimens. Magdalena Bay (No. 74813, U. S. N. M.); San Juanico, Gabb; Guaymas, E. Palmer (No. 23617, U. S. N. M.).

ARCA (SCAPHARCA) MULTICOSTATA, Sowerby.

Numerous examples.

Scammon's Lagoon on mud flats (No. 105596, U. S. N. M.), Hemphill;

San Quentin Bay, Belding; San Juanico, Gabb; Guaymas (No. 23616, U. S. N. M.), Dr. Palmer.

ARCA (NOETIA) GRANDIS, Broderip and Sowerby.

A few examples. Guaymas (No. 23616, U. S. N. M.), Dr. Palmer; San Juanico.

ARCA (BYSSOARCA) GRADATA, Broderip and Sowerby.

Abundant. Point Escondido; St. Josef Island; La Paz. Ranges southerly to Ecuador.

ARCA (BYSSOARCA) SOLIDA, Sowerby.

Common. Point Escondido (No. 75012, U. S. N. M.); St. Josef Island; La Paz; found nearly everywhere in the Gulf, and in South America on the coast of Peru. The *Albatross* collection contained one valve from Sta. Margarita Island.

ARCA (BYSSOARCA) REEVIANA, Orbigny.

Several specimens. Mulege Bay (No. 74825, U. S. N. M.); La Paz (No. 34100, U. S. N. M.), Belding; San Ignacio Lagoon (No. 105612, U. S. N. M.), H. Hemphill, "underside of stones."

ARCA (BYSSOARCA) MUTABILIS, Sowerby.

One living example. Tres Marias (No. 102184, U. S. N. M.).

PECTUNCULUS (AXINÆA) MACULATA, Broderip.

Three examples. La Paz (No. 63782, U. S. N. M.), S. Pillsbury.

PECTUNCULUS (AXINÆA) TENUISCULPTUS, Carpenter.

Several specimens. Carmen Island (No. 63776, U. S. N. M.), Towne.

PECTUNCULUS (AXINÆA) GIGANTEUS, Reeve.

Numerous examples. La Paz and San Josef Island; Guaymas (No. 23547, U. S. N. M.), Palmer; Carmen Island (No. 63777, U. S. N. M.), Towne. An adolescent example at the first named locality was collected by Capt. Forrer (No. 63781, U. S. N. M.), and Fisher's, from St. Josef Island, were all young shells. Towne's Carmen Island specimens were very fine.

Family LEDIDÆ.

LEDA (YOLDIA) LANCEOLATA, Lamarck.

Numerous valves. Gulf of California (No. 73667, U. S. N. M.).

This form is exceedingly rare; odd values are occasionally met with in beach rubbish.

Family CARDITIDÆ.

CARDITA PECTUNCULUS, Bruguiere.

+ *C. affinis*, SOWERBY.

+ *C. Californica*, DESHAYES.

Two specimens.

La Paz (No. 73610, U. S. N. M.); Loreto (No. 73611, U. S. N. M.), Dr. Gabb. Sta. Margarita Island (two good examples), *Albatross*.

CARDITA (VENERICARDIA) FLAMMEA, Michelin, 1830.

+ *C. varia*, BRODERIP, 1832.

+ *C. tumida* of the same author.

Several specimens. Tres Marias (No. 73619, U. S. N. M.); Mulege Bay (No. 73618, U. S. N. M.).

Magnificent examples of this fine species have been dredged by the U. S. Fish Commission steamer *Albatross*. These are of a pinkish color with whitish and darker markings, and measure 69 millimeters from beak to ventral margin (about $2\frac{3}{4}$ inches).

CARDITA (VENERICARDIA) CRASSA, Gray.

One specimen. Tres Marias (No. 73625, U. S. N. M.).

The single example of this well-marked form obtained is about two-thirds the size of the figure in Reeve's monograph, species 34.

Family CRASSATELLIDÆ.

CRASSATELLA GIBBOSA, Sowerby.

One adolescent specimen.

San Lucas Cove (No. 75033, U. S. N. M.). The example, though small, is quite characteristic; it was obtained by dredging. This species is exceedingly rare. Dr. Jones collected four odd valves at Payta, Peru, in 1884, and Gabb detected it at Loreto in 1867 (No. 73522, U. S. N. M.); Guaymas, Dr. Palmer (No. 23548, U. S. N. M.).

Family LUCINIDÆ.

LUCINA (DIVARICELLA) DENTATA, Wood.

Examples. San Juanico and Loreto; Dr. Gabb.

An interesting form occurring in the Atlantic. Dall gives the range from Georges Bank off Hatteras, to the West Indies, thence southerly to Brazil, in from six to fifty-two fathoms. The above is the *Cyclas dentata* of the older authors.

LUCINA BELLA, Conrad.

Fresh specimen. Gulf of California.

A single example in perfect condition. Precise locality not stated. Not uncommon among Gulf material.

LUCINA CALIFORNICA, Conrad.

One specimen. La Paz (No. 41626, U. S. N. M.), A. Forrer.

LUCINA NUTTALLI, Conrad.

Numerous examples.

La Paz (No. 101750, U. S. N. M.); also at various places on the ocean side of Lower California to California proper, San Diego, San Pedro, etc.

LUCINA (CODAKIA) TIGRINA, Linnaeus.

Several examples.

Pichilique Bay (3 fresh valves); *Albatross*. Carmen Island (No. 73497, U. S. N. M.), Towne; Gulf of California (No. 73496, U. S. N. M.); La Paz (No. 34094, U. S. N. M.), L. Belding. This is another widely distributed species, credited to various remotely separated regions. Garrett* gives the Viti and Samoan islands as localities in the Indo-Pacific province. Dall† gives the Atlantic range as St. Augustine, Fla., Florida Keys, West Florida, Texas, Bermuda, to Aspinwall, and it occurs fossil as far back as the Pliocene.

Family DIPLDONTIDÆ.

DIPLDONTA ORBELLA, Gould.

Two examples.

Point San Quentin (No. 73632, U. S. N. M.); also, San Juanico, collected by Dr. Gabb; Gulf of California (No. 41603, U. S. N. M.).

DIPLDONTA (FELANIA) SERRICATA, Reeve.

Several examples.

Mazatlan (No. 73635, U. S. N. M.); San Ignacio Lagoon (No. 105621, U. S. N. M.), Hemphill; Gulf of California, at head of the Gulf, Dr. Palmer (No. 58335, U. S. N. M.).

Family GALEOMMIDÆ.

SCINTILLA CUMINGII, Deshayes.

Two examples.

Gulf of California (No. 73628, U. S. N. M.); Cape St. Lucas (No. 41613, U. S. N. M.). A very rare form. From Todos Santos Bay (No. 102187, U. S. N. M.), the Museum contains what may prove to be another species of this genus.

Family LASEIDÆ.

LASEA RUBRA, Mont.; var. SUBVIRIDIS, Carpenter.

Several examples.

Cape St. Lucas (No. 74018, U. S. N. M.); San Quentin Bay (No. 75032,

* Catalogue IV, Museum Godeffroy, May, 1869.

† Marine Mollusks S. E. coast of the United States, 1889.

U. S. N. M.), "found among *Mytilus* on rocks [Fisher], April 27, 1876;" also at Monterey, Cal., two specimens. The foregoing was Dr. Carpenter's determination, copied from his label.

Family CHAMIDÆ.

CHAMA PANAMENSIS, Reeve.

One example; La Paz, Capt. Forrer.

CHAMA? FRONDOSA, Broderip.

Three specimens.

Gulf of California (No. 74805, U. S. N. M.), attached to valve of *Meleagrina fimbriata*. Altogether a fine series.

At Station 2828, off Lower California, in 10 fathoms (probably this species), *Albatross*.

Family CARDIIDÆ.

CARDIUM SENTICOSUM, Sowerby.

Several examples.

San Juanico; also found in the Gulf of California at the head of the Gulf (No. 36085, U. S. N. M.); Dr. E. Palmer (No. 63752, U. S. N. M.). Very close to the more northern "*quadrigenarium*" of Conrad, and may prove to be the same.

CARDIUM PROCERUM, Sowerby.

One specimen.

Magdalena Bay (No. 63740, U. S. N. M.); Guaymas (No. 23499, U. S. N. M.), Dr. Palmer. Ballenas Bay (valves), and on good example at Pichilique Bay, *Albatross*.

CARDIUM MACULOSUM, Wood.

One valve.

Gulf of California (No. 63744, U. S. N. M.), Stearns collection; an exceedingly rare and characteristic species.

CARDIUM CONSORS, Broderip and Sowerby.

Several examples; common.

La Paz (Nos. 34091, 63748, U. S. N. M.); Mazatlan (No. 63747, U. S. N. M.); Acapulco (No. 13783, U. S. N. M.); Carmen Island (No. 63746, U. S. N. M.), Towne. This last is rather varietal than typical, being not quite characteristic. The *Albatross* dredged two dead valves at Station 2828, 10 fathoms off Lower California.

CARDIUM (PAPYRIDEA) ASPERSUM, Sowerby.

One example.

La Paz, Forrer (No. 63769, U. S. N. M.). The National collection has the same species from Carmen Island (No. 63768, U. S. N. M.); La Paz

(valve), L. Belding (No. 34092, U. S. N. M.); Gulf of California several (No. 63767, U. S. N. M.); San Juanico, Gabb.

A rare species and closely approaching the Antillean *P. bullatum*. Cuning collected it at St. Elena, on the coast of Guayaquil, in latitude about 2° south.

CARDIUM (LIOCARDIUM) APICINUM, Carpenter.

= ? *Elenense*, Carpenter's Maz. Cat.

Numerous examples.

Boea de los Piedras (No. 63759, U. S. N. M.), fine examples. A variety of this species was obtained at Mulege Bay (No. 63760, U. S. N. M.), two specimens; Mazatlan (No. 63758, U. S. N. M.); Cape St. Lucas (No. 63761, U. S. N. M.), Xantus.

CARDIUM (LIOCARDIUM) ELATUM, Sowerby.

Numerous examples.

Guaymas; Pinecate Bay (No. 23515, U. S. N. M.), Dr. E. Palmer; Gulf of California (Nos. 63737, 34093, U. S. N. M.); San Ignacio Lagoon (No. 105398, U. S. N. M.), and San Diego (No. 63738, U. S. N. M.), Henry Hemphill. A magnificent species. Our largest example, a single valve measures $6\frac{5}{8}$ by $5\frac{5}{8}$ inches. Santa Margarita Island (one valve), *Albatross*.

Family VENERIDÆ.

VENUS MULTICOSTATA, Sowerby.

Several examples.

Esecondido Bay (No. 63667, U. S. N. M.), Fisher; La Paz, Forrer.

The largest of Mr. Fisher's specimens measured, length 4.75, height 3.87, breadth 2.63 inches. The young of the above might easily be mistaken for adolescent shells of *V. reticulata* or *V. puerpera*, Indo-Pacific species. Notwithstanding the very great quantity of West coast material that has passed under my examination, Mr. Fisher's were the first specimens that I had seen from the Gulf region.

VENUS CRENIFERA, Sowerby.

Several examples. Carmen Island (No. 63598, U. S. N. M.), Towne; Cape St. Lucas (No. 23594, U. S. N. M.), Dr. Palmer; also same locality (No. 13732, U. S. N. M.). A rare and beautiful species.

VENUS (ANOMALOCARDIA) SUBRUGOSA, Sowerby.

= No. 112. Carpenter's Maz. Cat.

Abundant.

Mulege Bay; Gulf of California; Guaymas (No. 23589, U. S. N. M.), Dr. Palmer; a single specimen, the smallest I have seen, only .36 inch long by .29 inch in height, having every aspect of maturity; it would lead a person, without a large series of all ages for comparison, to regard

it as a different species. Adults measure from .97 inch to 1.53 inches long, by .80 inch to 1.25 inches high, respectively. Though a strongly characterized species, several individuals are requisite to properly represent it. The National collection contains a beautiful variety of the above (No. 63567, U. S. N. M.) from Nicaragua, in which the rounded concentric ridges are quite regular, and extend over the entire surface of the valves to the ventral edge.

VENUS (ANOMALOCARDIA) SUBIMBRICATA, Sowerby.

One perfect example, several valves. Santa Margarita Island, *Albatross*.

VENUS (ANOMALOCARDIA) KELLETTII, Hinds.

Numerous examples.

Mulege Bay (No. 41617, U. S. N. M.), one junior, less than half an inch (transverse) length; Guaymas (No. 23567, U. S. N. M.), Dr. Edward Palmer; also numerous valves from the latter place (No. 103280, U. S. N. M.).

VENUS (CHIONE) UNDATELLA, Sowerby.

A single example. Tres Marias (No. 63605, U. S. N. M.).

A single specimen of this beautiful species, distinguished by its fine, closely approximating concentric costae crossing rather broad, flat or slightly rounded radiating ribs, more or less marked with light brown, in zigzag waves, and spotted or blotched on the surface of the valves. Lunule rounded cordate and dark brown. Ligamental area deeply excavated and marked with brown bars on the left valve. Hinge line very heavy. Muscular and pallial scars strongly impressed. Color inside, light orange and purple.

The various forms of this genus are so profusely abundant on the West coast, and exhibit so much variation through the influence of station, character of the sea bed, etc., that no doubt too many species have been made. The West American group requires careful revision.

VENUS (CHIONE) FLUCTIFRAGA, Sowerby.

Two examples.

San Juanico (No. 74264, U. S. N. M.); Scammon's lagoon; Colorado River, Fort Yuma (No. 36409, U. S. N. M.); Guaymas (No. 23595, U. S. N. M.), Dr. Palmer. Extends northerly along the coast to San Diego and San Pedro.

VENUS (CHIONE) SUCCINCTA, Valenciennes.

Not uncommon. San Juanico; Loreto (doubtful). Guaymas (No. 23592, U. S. N. M.), Palmer; La Paz (No. 34084, U. S. N. M.), L. Belding.

VENUS (CHIONE) SIMILLIMA, Sowerby.

Several specimens.

San Quentin Bay (No. 34503, U. S. N. M.), Belding; San Juanico; Todos Santos Bay (No. 74268, U. S. N. M.), Hemphill. *C. succincta* and

C. simillima, are common species as far north as San Diego and San Pedro. Pichilique Island, numerous examples, living; *Albatross*.

VENUS (CHIONE) NEGLECTA, Carpenter.

Not uncommon.

Boca de los Piedras (No. 73917, U. S. N. M.); Magdalena Bay (No. 63604, U. S. N. M.); Cape St. Lucas (No. 23558, U. S. N. M.), Dr. Palmer (?) Cerros Island (No. 13656, U. S. N. M.).

Eight, all juniors at the first place, numerous examples at the others.

VENUS (CHIONE) COLUMBIENSIS, Sowerby.

Several examples.

Mazatlan (No. 63594, U. S. N. M.), H. Edwards (No. 2431, U. S. N. M.). Rich collection. Upon a revision of this group, the position of the above species may have to be changed.

VENUS (CHIONE) GNIDIA, Broderip and Sowerby.

Numerous examples.

Guaymas (No. 23498, U. S. N. M.), Palmer; Mulege Bay (No. 2501, U. S. N. M.); La Paz (No. 34083, U. S. N. M.), Belding; San Ignacio Lagoon (No. 105597, U. S. N. M.), Hemphill. A fine species and comparatively abundant.

CYTHEREA (CALLISTA) CHIONÆA, Menke.

Two adolescent examples.

La Paz (No. 63524, U. S. N. M.); Scammon's Lagoon; San Juanico; Loreto; Pichilique Bay (common), and Sta. Margarita Island (valves); Station 2828, two fresh specimens in 10 fathoms, *Albatross*.

This common species is found at a great many places in the Gulf and on the outer shore of the peninsula of Lower California. Gabb collected it at San Juanico, also at Loreto on the Gulf side (No. 63525, U. S. N. M.). It is frequently found in large numbers on Carmen Island, cast up on the beach after a storm. A rare and beautiful variety, resembles in its color markings the Asiatic *Cytherea petichialis*, which has led to said species being credited to the west coast of America.

CYTHEREA (CALLISTA) AURANTIA, Hanley.

Three valves in good condition. Pichilique Bay, *Albatross*.

CYTHEREA (CALLISTA) POLLICARIS, Carpenter.

One specimen. Mulege Bay (No. 63538, U. S. N. M.).

The example collected at the above place by Mr. Fisher I refer to Carpenter's species, on the basis of form and sculpture. Carpenter's type was collected by Xantus at Cape St. Lucas (No. 12721, U. S. N. M.); it is a large, white, smooth-surfaced shell, measuring laterally 63 mm. by 57 mm. from umbos to the ventral margin of the valves; while

Fisher's shell is correspondingly but 20 and 15 mm. Fisher's shell is painted with light yellowish-brown markings, while the Xantus-Carpenter shell has but a few slight indications of color. Another example agreeing closely with the Mulege shell is in the National collection, also a junior. A very rare species.

CYTHEREA (CALLISTA) VULNERATA, Broderip.

Two good specimens.

Station 2828, 10 fathoms, off Lower California; *Albatross*.

This is a beautiful species, but not uncommon at many places around the shores of the Gulf and peninsula.

CYTHEREA (CALLISTA) NEWCOMBIANA, Gabb.

One specimen.

Boca de los Piedras (No. 41628, U. S. N. M.). Ranges to Catalina Island and northward on the coast of California.

CYTHEREA (TIVELA) RADIATA, Sowerby.

One example. San Juanico. Common in the Gulf.

CYTHEREA (TIVELA) CRASSATELLOIDES, Conrad.

One junior only 22 mm. long. Ballenas Bay, *Albatross*. Abundant farther north.

DOSINIA PONDEROSA, Gray.

Three specimens.

Gulf of California (No. 63511, U. S. N. M.); San Juanico. The above is fully as common in the Gulf region and at various places on the ocean side of the peninsula as *D. Dunkeri*, Philippi is in the neighborhood of Panama. Carpenter's species *D. Annæ* seems to be of rather rare occurrence. *D. ponderosa* is also reported from Scammon's Lagoon.

DOSINIA PROSTRATA, Linnaeus.

One valve (the left); beach. Gulf of California (No. 74235, U. S. N. M.).

Among the miscellaneous material in the Fisher collection was a single valve, the left, of a species of *Dosinia* unlike either of the species heretofore credited to this province or region. I sent it to the late Mr. Tryon for comparison with the various forms of *Dosinia* in the collection of the Philadelphia Academy; he returned it with the comment that it "exactly corresponds with *D. prostrata* from Coromandel (Chemnitz)."

The shell certainly differs from *Annæ*, *Dunkeri* and *ponderosa*. I should regard the occurrence of the above at any point in the Gulf

region as in some way fortuitous were it not for the other forms herein mentioned, such as *Cassis viber*, *Murex palma-rosa Mexicana*, *Purpura hippocastaneum*, etc., some of which have been verified as to locality by other collectors, etc.

Subfamily TAPESINÆ.

TAPES GRATA, Say.

Numerous specimens.

Los Animas Bay (No. 63587, U. S. N. M.); Loreto (No. 63586, U. S. N. M.). This well known and pretty species is quite widely distributed on the West coast; the National collection contains examples from a great number of localities collected by Hemphill, Bridges, and others. Several fresh valves were obtained at Sta. Margarita Island by the *Albatross*.

Family DONACIDÆ.

DONAX CARINATA, Hanley.

Three specimens. Altata, A. J. Gove (No. 63671, U. S. N. M.). A rare and beautiful form.

74. DONAX TRANSVERSUS, Sowerby.

One specimen. Altata, Gove (No. 63672, U. S. N. M.). This is another rare species.

DONAX PUNCTATOSTRIATUS, Hanley.

Three examples. Altata (No. 63673, U. S. N. M.).

DONAX FLEXUOSUS, Gould.

One specimen. San Juanico.

HETERODONAX BIMACULATUS, Orbigny.

= *Tellina vicina*, C. B. ADAMS.

Numerous large, fine specimens.

Angeles Bay (No. 73535, U. S. N. M.), and all around the Gulf of California, nearly everywhere up to northern California; southerly to Panama; also in the Antillean waters. The Gulf shells exhibit in many instances very beautiful coloration.

Family PSAMMOBIIDÆ.

PSAMMOBIA REGULARIS, Carpenter.

Valves, beach. Tres Marias (No. 73516, U. S. N. M.).

This form, described by the late Philip Carpenter in the Ann. and Mag. of Natural History (third series) Vol. XIII, 1864, is quite rare in collections and only occasionally met with in fragments or odd valves

in beach rubbish from the Gulf of California. It is barely possible that it is only an extra limital, dwarfed, delicate aspect or southern form, of *P. rubroradiata* of Conrad of the Northern Californian and Vancouver province, where *rubroradiata* attains a large size.

Two examples of *regularis* give the following dimensions from anterior to posterior margins: largest, 1.44, smallest, 1.21 inches.

TAGELUS CALIFORNIANUS, Conrad.

= *Solecurtus Californianus*, CONRAD.

= *S. affinis*, C. B. ADAMS.

Four examples. San Lucas Cove (No. 73474, U. S. N. M.); San Juanico.

The individuals examined, are small compared with the average of examples from Northern California localities; the largest measuring only 2.10 inches from anterior to posterior extremities, but unquestionably of this species.

SOLETELLINA RUFESCENS, Chemnitz.

Three specimens. Altata (No. 73547, U. S. N. M.), Gove.

SANGUINOLARIA KINDERMANNI, Philippi.

Several Examples. San Juanico.

Family TELLINIDÆ.

TELLINA, doubtful species.

One example. La Paz, Capt. Forrer (No. 102182, U. S. N. M.).

TELLINA (TELLINIDES) PURPUREUS, Broderip.

= *T. Broderipii*, DESHAYES.

Valves beach. Altata, Gove (No. 73545, U. S. N. M.); Acapulco, Jewett (No. 15994, U. S. N. M.). A rare species.

MACOMA VIRIDITINCTA, Carpenter.

One specimen. La Paz, Capt. Forrer; Gulf of California, various localities; rather rare.

Family SEMELIDÆ.

SEMELE BICOLOR, C. B. Adams.

One example. Loreto, Gabb.

SEMELE CORRUGATA, Broderip.

Valves and fragments. Sta. Margarita Island; *Albatross*.

Family MACTRIDÆ.

MACTRA (STANDELLA) PLANULATA, Conrad.

Specimens. San Juanico. Station 2828, 10 fathoms off Lower California; *Albatross*.

LABIOSA UNDULATA, Gould.

= *Raeta undulata*, GRAY.

Valves only; rare. Loreto, Gabb. Occurs elsewhere in the Gulf and up the coast northward to San Pedro.

Family ANATINIDÆ.

THRACIA PLICATA, Deshayes.

= *T. truncata*, MIGHELS.

Very rare; valves only. La Paz (No. 73602, U. S. N. M.).

PERIPLOMA PLANIUSCULA, Sowerby.

+ *P. lenticularis*, SOWERBY.

= *P. argentaria*, CONRAD.

= *P. alta*, C. B. ADAMS.

= *P. excurva* + *excurvata*, CARPENTER.

Numerous examples.

San Juanico (No. 73518, U. S. N. M.); Loreto (No. 73517, U. S. N. M.), Gabb. Common at many places on the ocean coast of the peninsula; northward to San Pedro; common in the "fossil bank" at Spanish Bight, Coronado peninsula, San Diego; perhaps northerly to Point Concepcion.

Family CORBULIDÆ.

CORBULA BICARINATA, Sowerby.

Numerous specimens.

Gulf of California (No. 73500, U. S. N. M.); Boca de los Piedras (No. 73641, U. S. N. M.); Mulege Bay (No. 73645, U. S. N. M.).

Class SCAPHOPODA.

Family DENTALIIDÆ.

DENTALIUM FISHERI, provisional name.

One example. Los Animas Bay (No. 46204, U. S. N. M.).

DENTALIUM SEMIPOLITUM, Carpenter.

Numerous specimens.

Mulege Bay (Nos. 46201, 46202, U. S. N. M.); Boca de los Piedras (No. 46203, U. S. N. M.). Hemphill has collected this species at San Ignacio Lagoon, Lower California (No. 105517, U. S. N. M.).

Class GASTROPODA.

Family BULLIDÆ.

BULLA ADAMSI, Menke.

Several specimens.

Bocas de los Piedras and Loreto, Gulf of California.

Less globose and inclined to be heavier and more solid than *B. nebulosa* Gould. The latter averages much larger than *B. adamsi*.

Family APLYSIIDÆ.

DOLABELLA CALIFORNICA, Stearns.

Dolabella californica, STEARNS, Proc. Phila. Acad. Nat. Sci., 1878, p. 395, Pl. VII, figs. 1, 2; Proc. U. S. Nat. Museum, Vol. XVI, pp. 341-342, 1892.

Several examples (No. 75001, U. S. N. M.). Mulege Bay, Gulf of California.

Superfamily MONOTREMATA.

Family HELICIDÆ.

HELIX (ARIONTA) AREOLATA, Forbes.

= *Euparypha** *areolata*, BINNEY.

Abundant (No. 58470, U. S. N. M.). Santa Maria Island, Lower California.

*Whatever may be the subgeneric or sectional value of *Euparypha*, I do not believe that any of the West American species can properly be assigned to it. Environmental influences have brought about certain external facies analogous to those exhibited by some of the terrestrial species that inhabit the Mediterranean region, the Canaries and Madeira, where, to a certain extent, similar environmental factors exist.

I regard all of the west coast forms to which the names of *Tryoni*, *areolata*, *Veatchii*, *pandora*, *laris*, etc., have been given as physiographical aspects or modifications of *Arionta*, as this genus is represented on the west coast by the more northerly and characteristic forms of central California, generally placed by systematists in H. and A. Adams's section *Lysina*.

Proceeding southerly from the regions of maximum or moderate rainfall or humidity the extremes of external characters, exhibited by the Helices of southern California and the peninsula, in color, solidity, elevation, etc., and general facies, when compared with their congeners of the central region, seem to me, when a large geographical series is examined, to be gradually approached. We should

Mr. Fisher found this species common on the shores of Santa Maria Bay, which is a small bay indenting an island of the same name outside of Magdalena Bay. The ample quantity he collected includes numerous solid shells of a pure opaque white with a somewhat glazed surface; others spotted here and there with sienna yellow and brown. Many examples are striped and ornamented with more or less conspicuous bands broken into squarish spots of the same color. Columella generally showing a single blunt tubercle, sometimes not.

From the U. S. Fish Commission, collected by the *Albatross* naturalists, a magnificent series has been received from Margarita Island (No. 10248, U. S. N. M.). These are of exceeding interest as related to the examples collected by Mr. Fisher, as the two lots illustrate how very considerable is the variation in color, size, and elevation within a comparatively limited area. The *Albatross* shells are, as a whole, much the largest that I have seen of this species.

HELIX (ARIONTA) AREOLATA, Forbes.

VAR. = *Veatchii*, NEWCOMB.

Numerous examples.

Helix Veatchii (No. 58504, U. S. N. M.), a form generally regarded as a variety of *H. areolata*, occurs on Cerros Island. It was a specimen of this that furnished an interesting illustration of the extraordinary vitality of these insignificant animals. Dr. Veatch collected numerous specimens on the island in 1859, and gave some of them to Thomas Bridges. These ultimately passed into my hands. One day, upon examining them, I noticed that one was alive. I placed it in a box of moist earth, and in a short time it commenced crawling about, apparently as well as ever. After a fortnight's furlough from its long imprisonment in a small box, I put it back again. *It had lived six years without food.** The famous British Museum example of *Helix desertorum* lived nearly *four years*. This last species is from a region in which the physical characteristics are in many respects like those of Cerros Island and Lower California.

expect to find a wide range of modification within a territory so peculiar, practically a long and narrow belt extending through some 1,000 or 1,200 miles of latitude, from a region of ample, not to say excessive, moisture or humidity to one of extreme aridity, to say nothing of other diverse characteristics which play their part in influencing or inducing variation.

Whatever may be the value of the characters of the soft parts in the land snails as a basis for grouping or generic segregation, Binney has found in *Tryoni*, which he has placed in *Euparypha*, certain characters in common with *Arionta* (*Stearnsiana*), in others it is different. Whether this difference is of greater than specific weight or anything more than varietal, remains to be investigated, for it is yet to be proved whether the soft parts are out and out, less variable or more constant in their characters than the hard parts, that is to say, the external inclosing shell.

* Proc. California Acad. Nat. Sciences, March 4, 1867.

Besides the specimens of the above, received in the Stearns collection the National Museum contains three of the original lot collected by Dr. Veatch on Cerros Island (Nos. 8715, 8716, U. S. N. M.), two collected by Lieut. Pond (No. 103610, U. S. N. M.), five received from Mr. Belding, collected by him near San Quentin Bay (No. 34525, U. S. N. M.), one example from an island in said bay (No. 73433, U. S. N. M.), numerous examples from Cerros Island (U. S. Fish Commission, No. 102421, U. S. N. M.), and two examples collected by Henry W. Henshaw on Cerros Island (No. 63986, U. S. N. M.).

HELIX (ARIONTA) LÆVIS, Pfeiffer.

= *Euparypha laevis*, BINNEY.

+ *Polymita laevis*, TRYON.

Abundant; dead. Ascension Island, Lower California (No. 58527, U. S. N. M.).

This island is of small area; it is situated south of Cedros, or Cerros, in latitude 27°. The above, as well as *H. pandora* Fbs., are probably dwarfed varieties of *areolata*. A large number, all dead, were obtained by Mr. Fisher. They exhibit a rather wide range of variation, particularly in elevation, and the tubercle on the columella is shown to be an inconstant character; the color markings are variable, as in *areolata*. From Fisher's notes I learn that he found the foregoing "on plateaus from 50 to 300 feet above the sea level, in great numbers, embedded in sand mixed with guano. Found only *four plants*, small shrubs (individuals), on the island, otherwise utterly destitute of vegetation." In conversation Mr. Fisher informed me that the specimens he obtained had been scratched out of the sand and guano by the sea-fowls in excavating or making a hollow for nesting purposes. It is quite evident that the faunal and floral character of the island has undergone a great change within quite recent times. Not many years ago when these snails were living, and before the sea-birds took possession of it, the surface of the island, which quite likely was never very densely clothed with vegetation, exhibited, we may presume, about the same floral aspect as others in the same general region. The birds, disturbed elsewhere, or from some other cause, invaded the territory of *H. laevis*, and in destroying the vegetation also extinguished the snails and such other forms of animal life as were dependent upon it for food. Fisher told me that he failed absolutely to detect a single *living* individual of *H. laevis*. Here we have an instance where the extension of the specific area of one form or class of animal life, obliterated or diminished the territory or specific area of another. It would be interesting to know of similar instances, for doubtless such have been observed and noted. Mr. Orcutt collected numerous examples of this species, living and in fine condition, near El Rosario Mission, in latitude 29° 50'. He found them "abundant under *Agave Shawii*, on high

mesa lands." The Museum is indebted to him for an excellent series (Nos. 98930, 98931, U. S. N. M.), which includes also a dark-colored variety (No. 98932, U. S. N. M.).

HELIX (POLYGYRA) BEHRI, Gabb.

Several examples. Near Guaymas (No. 58514, U. S. N. M.); banks of Yaqui River (No. 23766, U. S. N. M.), Gabb.

A few specimens (seven or eight), all dead and bleached, though otherwise perfect, were detected as above by Mr. Fisher. The species was described by the late Prof. Gabb, in volume 1 of the American Journal of Conchology, 1865, p. 208, from specimens collected by the lamented Auguste Rémond, near Guaymas, on the easterly side of the Gulf of California. The specimens collected by Rémond were also dead, as implied by Gabb's description, wherein he says "colore albo (?)". When living they are probably of a pale horn color, like others of this group found in the same general region. The Fisher shells, though having the same number of whorls and agreeing with Gabb's description, vary in diameter from 0.49 to 0.67 of an inch. To verify my determination, specimens were submitted to my esteemed friend, the late Thomas Bland, of New York, whose kind services in connection with the above and other critical West American forms, are gratefully remembered and acknowledged.

HELIX (POLYGYRA) BICRURIS, Pfeiffer.

Ten examples.

Gulf of California region (No. 56957, U. S. N. M.); Monterey, Mexico (No. 121028, U. S. N. M.); Texas, at Brownsville; also at mouth of the Rio Grande (Nos. 123168, 123594, U. S. N. M.), William Lloyd.

HELIX (POLYGYRA) HINDSII, Pfeiffer.

One specimen. Near Guaymas (No. 97974, U. S. N. M.).

HELIX (POLYGYRA) ACUTEDENTATA, W. G. Binney.

Three examples. Mazatlan (Nos. 56942, 56943, U. S. N. M.), Henry Edwards.

HELIX (POLYGYRA) VENTROSULA, Pfeiffer.

Several specimens. Mazatlan (Nos. 56944, 60614, U. S. N. M.), Henry Edwards.

HELIX (POLYGYRA) PLATYGLOSSA, Pfeiffer.

Five examples.

Mazatlan (No. 56958, U. S. N. M.); City of Mexico (No. 56931, U. S. N. M.) Puebla, Puebla (No. 56930, U. S. N. M.). The latter were presented

to the Museum several years ago by the Mexican Geographical Commission.

HELIX (STENOTREMA) HIRSUTUM, Say.

Examples. Banks of Yaqui River near Guaymas (No. 37282, U. S. N. M.).*

Of this form Mr. W. G. Binney remarks, in his "Manual of American Land Shells," page 279, a "postpliocene species now found over the northern and interior regions as far as Kansas and Virginia, and even into Alabama." Mr. Pilsbry, in his recent Check List of N. A. Land Shells, credits it to the "Eastern United States."

Upon examining some shells collected on the west coast several years ago by Dr. Edward Palmer, I found that he had obtained this form on the banks of the Yaqui River. It is noteworthy how frequently of late years species heretofore regarded as exclusively eastern or north-eastern turn up somewhere on the West coast. A few years ago Dr. Cooper sent specimens of what proved to be, on Dr. Dall's identification, *Hyalina Binneyana* Morse, from Vancouver Island, B. C., previously credited to the "Southern part of Maine, Michigan, Massachusetts, Vermont," and Mr. Hemphill found *Helicodiscus lineatus*, another of Say's species, several years ago in Oakland, on the eastern side of San Francisco bay. This had previously been reported as far to the west as the Rio Chama, New Mexico.

Dr. Cooper, in his recent paper before referred to, describes a varietal form of the last named species, to which he has given the name of *Helicodiscus lineatus Sonorensis* detected near San Miguel, in the State of Sonora.

Family ORTHALICIDÆ.

ORTHALICUS UNDATUS, Bruguiere.

One specimen. Tres Marias (No. 56975, U. S. N. M.).

The above example was collected living; the color pattern is of the usual irregularly undulating zigzag wave, and clouds, with rather a darker hue than the average of Florida specimens, and the aperture, or around the aperture, exhibits more or less of the darker tint that prevails over the general surface of the shell. The museum contains several examples of this species from Altata (No. 56973, U. S. N. M.), and I presume it is found at many points on the mainland in the timbered regions of the Mexican States of Sonora and Cinaloa, from whence it is brought in the dyewoods to the embarcaderos along the gulf shore. The Altata shells are on the whole somewhat lighter in general tone, though exhibiting the usual color pattern. The individuals of this form vary greatly in proportions as well as in color markings; in the former

* Vide "Nautilus," November, 1889.

respect they are like the *Bulimuli* of Texas on the one side and Lower California on the other.

ORTHALICUS UNDATUS, Bruguiere.

var. ?=*O. melanochilus*, VALENCIENNES.

One specimen. Tres Marias (No. 56974, U. S. N. M.).

A living example nearly white, upper whorl pinkish white; without color markings save two narrow dark brown oblique *varical* lines on the penultimate and final whorl. The parietal wall and the edge of the outer lip blackish-brown as usual in the common dark colored specimens from Central America. Length 2.20 inches.

I regard this as simply a variety of the previous form, and both the same with the Central American and Florida shells so far as species are considered. The albinism of the foregoing specimen is of interest when considered in relation to the environment and general character of the region wherein it is indigenous.

Family BULIMULIDÆ.

BULIMULUS (SCUTALUS) BAILEYI, Dall.

= *B. Xantusi*, var. *Stearns*, not *Binney*. Proc. U. S. Nat. Mus., vol. xvi, 1893, pp. 640-641, pl. LXXI, fig. 1.

Several examples. *

Cape St. Lucas (No. 58649, U. S. N. M.); Guaymas, E. Palmer (No. 101756, U. S. N. M.); Ortiz, V. Bailey (No. 106004, U. S. N. M.). Five specimens of what I regarded as a variety of Mr. Binney's species were given to me by Mr. Fisher. The precise locality not stated, or else the label was mislaid. The smallest of the five is larger than Binney's figure in his Land and Fresh Water Shells of North America, part 1, p. 210. The incremental lines are well marked, but the revolving lines, an inconstant and quite uncertain character in West American Land Shells, I have barely detected in some of the specimens, of which all but one are dead. The largest measures 1.05 in length and .55 inch in breadth. They vary in solidity and opacity. This form is not confined to the peninsula. The National collection has received examples from the Department of Agriculture (No. 106004, U. S. N. M.), collected by Mr. Vernon Bailey "among rocks on the top of a hill 200 feet high," at Ortiz in the interior, a few miles back of Guaymas, in the fall of 1889; this fact as to locality is of some importance, as heretofore our knowledge of the distribution of these Mexican forms has been confined almost exclusively to the peninsula.

The discovery of Mr. Binney's type of *B. Xantusi* shows that the shells collected by Mr. Bailey are not referable to said species even in a varietal relation.

Mr. Gustav Eisen, of the California Academy of Sciences, has col-

lected *B. Baileyi* at Cape St. Lucas, thus verifying Fisher's notes as to habitat.

BULIMULUS (SCUTALUS) PALLIDIOR, Sowerby.

Five specimens. Carmen Island (No. 56591, U. S. N. M.), also Santa Margarita Island (No. 101036, U. S. N. M.).

The above examples are of the typical form, and I believe that these are the first of the species that have been reported from the islands or as having been found at a locality not on the peninsula. The last were collected by Mr. Townsend, of the U. S. Fish Commission steamer *Albatross*, and it will be noticed that these islands (Carmen and Margarita, are on opposite sides of the peninsula. The Santa Margarita specimens are of the rather robust variety described by Dr. Gould as *B. vegetus*.

An interesting example from Carmen Island, which is registered as *B. pallidior* Sby. (No. 58652, U. S. N. M.), exhibits such characters as make it a connecting link with Gould's *vegetus* and the *proteus* of Broderip so-called, in the tendency to that sculptural texture of the surface which is called shagreened, or covered with fine granulation. This aspect of sculpture is not uncommon in the land shells that inhabit insular stations, or saline, sterile, and alkaline sandy regions. Many species could be named which occasionally furnish individuals which exhibit this peculiar facies. Examples of this species collected by Prof. George Davidson at San Jose del Cabo (No. 58651, U. S. N. M.) in March, 1873, were kept by me undisturbed in a box until June 23, 1875, when they were taken out for examination. I placed them in a glass jar with some chickweed and other tender vegetable food, and a little tepid water so as to make a warm humid atmosphere. This hospitable treatment induced them to wake up and move about after their long fast and sleep of two years, two months, and sixteen days. Subsequently all died but one, which was exhibited at a meeting of the Cal. Acad. of Sciences, October 18, 1875. This latter example, it will be noticed, lived longer than his fellows, viz, two years and nearly seven months. These San Jose del Cabo specimens are now in the National Collection. The above has been referred to as an introduced form, which I regard as altogether improbable. The same aspects of variation that are seen in the shells of the *alternatus*, *Schiedeanus*, and *patriarchus* bulimoids of Texas, Louisiana, etc., are exhibited in a greater or less degree by their relatives of the Gulf of California region, more particularly by the *pallidior* form, which often exhibits great difference in the size of examples from one colony as compared with specimens from another locality. The roughened surface forms of *pallidior* have been named by Dall *var. striatula*.

BULIMULUS (ORTHOTOMIUM) SUFFLATUS, Gould.

+ *B. vesicalis*, GOULD.

Numerous examples.

Point San Quentin (Nos. 9441, 9442, U. S. N. M.) Fisher, and La Paz, Belding (Nos. 34116, 34118, U. S. N. M.), and same locality Capt. Forrer. The National Collection has other examples from "Lower

California" (Nos. 56945, 56946, U. S. N. M.). Some individuals are much more globose than others; the juniors of the latter form suggest "*pilula*;" but this last is probably distinct. To the slenderer form of *sufflatus* Dr. Cooper has given the varietal name of *insularis*, resting on examples collected by Mr. W. E. Bryant on Espiritu Santo Island. Belding collected the same at La Paz, and a large series from various localities show a regular graduation from one extreme to the other as in many other species of *Bulimulus*.

BULIMULUS (DRYMÆUS) ZIEGLERI, Pfeiffer.

Three examples, living. Altata (No. 57227, U. S. N. M.).

The above bears a very close relationship to *B. serperastrus* Say, and may prove to be a local variety of that species. The specimens were carried to San Francisco in a cargo of dyewood; their actual habitat is no doubt some distance back from the shore, as Altata is simply a landing and loading place for vessels in the Gulf trade. Mr. Lloyd, of the biological division of the U. S. Agricultural Department, collected three examples of *serperastrus* (No. 123595, U. S. N. M.) at Hidalgo, Mexico, in 1889.

BULIMULUS (DRYMÆUS) CALIFORNICUS, Reeve.

= *Bulimus Californicus*, REEVE, Icon. No. 378, Dec. 1848.—PFEIFFER, Mon. Hel. Viv., III, 422.

One example (No. 56955, U. S. N. M.).

This species credited to California by Reeve has always, so far as habitat is considered, been regarded with doubt by west-coast collectors and authors, for two reasons; first, the occurrence of any form of the group resembling Reeve's figure and compatible with his description has never been verified either from California proper or the peninsula of Lower California; second, the California of the older authors seems to have been a sort of geographical waste-basket, more convenient than authentic in matters pertaining to distribution.

That excellent conchologist, Dr. Gould, regarded the above species as identical with Say's *B. serperastris*;^{*} it may prove to be the same. Mr. W. G. Binney dissents from Dr. Gould. Having had occasion to examine and determine several unlabeled specimens from the Gulf region (Stearns collection) I detected a single example of *Californicus*. The specimen exhibits less color marking than is shown in Reeve's figure, but otherwise agrees satisfactorily. On the testimony of this solitary example, I am of the same opinion as Mr. Binney.

Superfamily DITREMATA.

Family ONCHIDIIDÆ.

ONCHIDELLA BINNEYI, Stearns.

Proc. U. S. Nat. Museum, Vol. XVI, 1893, pp. 342, 343.

Several examples (No. 58824, U. S. N. M.). San Francisquita Bay, Los Animas Bay, and Angeles Bay, in the Gulf of California.

^{*} Binney Terr. Moll. U. S. Vol. III, p. 275.

Family LIMNÆIDÆ.

PLANORBIS BICARINATUS, Say.

Many examples.

Mouth of Yaqui River (No. 53677, U. S. N. M.), Dr. Edward Palmer; Portland, Oreg. (No. 47600, U. S. N. M.), and Antioch, Cal., Henry Hemphill.

It is interesting to note the wide distribution of this comparatively well-marked form, to which I have heretofore and at greater length called attention.*

Commencing at Cape Elizabeth, Maine; thence westerly through Lake Simcoe, Canada; thence to Manitoba (Miller Christy), and Winnipeg Lakes (*teste* Bell), still westerly to Portland, Oreg.; thence southerly to the Yaqui River locality near Guaymas, Mexico; thence easterly through Kansas, Alabama, and Georgia nearly to the Atlantic seaboard by the way of Virginia, the District of Columbia, Pennsylvania, New York, and Massachusetts, to the starting point as above given in Maine.

The west-coast localities are as yet "few and far between," and the number of examples limited. It will be observed that there is a great stretch of territory between the Yaqui River locality and the Kansas region, as well as between the Oregon locality and Manitoba. It is not unreasonable to predict or anticipate the detection of *P. bicarinatus* sooner or later at localities intermediate and connecting, when these vast and sparsely-settled areas are more thoroughly explored or more generally inhabited.

The occurrence of *Helix* (*Stenotrema hirsuta*) near Guaymas is elsewhere referred to in this paper.

PLANORBIS CORPULENTUS, Say.

Several examples.

Cape St. Lucas, Prof. George Davidson, March, 1873. This species is widely distributed and inhabits an extensive geographical area on the western side of the continent, from the Columbia River in the north, thence easterly to Lake Winnipeg. Binney says "*P. corpulentus* is catalogued from Guatemala by Mr. Tristram."

Family SIPHONARIIDÆ.

SIPHONARIA LECANIUM, Philippi.

+var. *palmata*, CARPENTER; +*S. aquilirata*, CARPENTER; +? *S. pica*, SOWERBY.

Abundant. Tres Marias (No. 60386, U. S. N. M.).

The typical form in all stages from adolescence to maturity. It is

* West American Scientist, September, 1889.

evidently very abundant at these islands. In the younger or smaller specimens there is a tendency to a serial or alternate arrangement of prominent ribs with finer intermediate ones or riblets, as Carpenter terms them in his reference to this species in the Mazatlan catalogue, page 132, species 139.* The synonymy as above given is not complete; it should include other specific and varietal names; as the literature is not accessible by which I can verify the references and allusions to many species made by Carpenter and other authors whose comments I have read, I prefer to submit the above with my own notes and observations.

The variety *palmata* (No. 60396, U. S. N. M.) is simply a flattened form of *lecanium* occasionally met with. I regard *aquilirata* as a less strongly sculptured and a closely ribbed variety of *lecanium* minus intermediate riblets, or with smooth interspaces where riblets occur in typical *lecanium*.

The number of species and varieties which have been made is owing apparently to the excessive variability in the number of riblets as well as to the varying prominence of the same, also to variation in elevation or depression. Some individuals have 50 or more closely set nearly equal ribs, as do some of my largest specimens which measure 1.03 greatest length with an elevation of .55 inch; examples of these would be regarded as Carpenter's *aquilirata* (No. 60395, U. S. N. M.). Sometimes as many as 60 nearly equal ribs are exhibited in specimens only .69 inch in length, and .29 inch elevation. In these closely and equally ribbed individuals nearly or quite all of the ribs commence or start at the apex, are present in the adolescent shell, and are developed and maintained or continued with the growth of the shell through to maturity.

There is also a rather rare flattened intermediate form between those just described and the common coarsely ribbed ones, which connects the two, that is to say, the *aquilirate* variety with the typical *lecanium*, which has 30 to 40 nearly or quite equal ribs with only occasional inconspicuous inter-ribs or liræ; this variety probably Carpenter was not familiar with, as it is not common.

In the typical *lecanium* which is, so far as my observation goes, the most abundant in individuals, the prominent ribs vary in number from as few as 11 in young shells to 23 or more in adults, the interspaces being filled with fine striæ; it is often the case that the number of the coarse ribs in the same individual, in its earlier stages of growth, is less than the adult shell exhibits, as the coarse ribs often bifurcate at some incremental stage and continue, each part being of equal prominence with the main rib from which they forked or branched. Such instances of *lecanium* as exhibit the fewest ribs, when flattened make

* Mr. Fisher's specimens, though numerous, were, as a whole, rather small; a lot of about 70 not exceeding an average of .49 inch in length.

the variety *palmata*,* of which six examples now before me display from 24 coarse ribs in the largest specimen 1.03 inch in length to only 12 ribs in the smallest which measures only .47 of an inch in length; the exceeding prominence of the ribs in this specimen, projecting greatly beyond the margin, give the edge a digitated appearance, suggesting in miniature some of the Indo-Pacific limpets; for illustration *Patella saccharina* Linnaeus.

The various aspects presented by *lecanium* in its numerous varieties and intermediate forms are such, that to quote Carpenter,† “I have found it impossible to separate them,” hence my inclusion of his *aquilirata* in the synonymy herein given.

If, as Carpenter says,‡ “*S. maura* Sby., is one of the varieties of this species,” and “*S. ferruginea* Rve., is probably described from the intermediate forms” between *S. maura* and *S. palmata*, then these should be added to the synonymy. Carpenter regarded the form *aquilirata* as a Lower Californian rather than a Gulf species.§ He credits it to the northerly stations of Cerros Island (Ayres and Veatch’s collections), also to Margarita Bay (Pease shells) where he gives “*levinscula* Sby., teste Cuming,” as a synonym of it, and he also reports it as from Cape St. Lucas in the Xantus collection.

The Ayres, Veatch, Pease shells may be regarded as inhabiting exterior or ocean stations, being the outer or western coast of the peninsula, while the latter place, Cape St. Lucas as well as the Tres Marias, where both the typical *lecanium* and *aquilirata* variety are found, may be regarded geographically as well as biologically as intermediate middle or common ground, hence the occurrence or presence of both of these forms; or, again, if the *aquilirate* form should be by some persons viewed as an extra limital aspect of *lecanium*, then perhaps we should include in the group as varieties and therefore synonyms of the southern *S. costata*, a rather small, delicate, closely ribbed *aquilirate* shell, the ribs fine rather than coarse; this form is reported from Guacomayo (Cuming) Sowerby, and Panama (C. B. Adams); also in the Stearns collection from Panama (Bridges), and Valparaiso (Brannan); Dr. Jones obtained specimens at Payta. Some of the examples of *costata*, the more coarsely ribbed specimens, are so close to the selected delicate examples of *aquilirata* from the Tres Marias as to make it difficult if not impossible to satisfactorily segregate the two, were they mingled without previous marking, many individuals of each run so closely together. The southern *S. costata* is, aside from its inferior size and more delicate sculpture and structure, more helicoid-shaped, with the apex more or less recurved and nearer the margin.

* *S. lecanium*, with variety *palmata*, was plentiful at Cape St. Lucas. (Xantus Collection.) B. A. Report 1863, p. 621.

† Maz. Cat., p. 182.

‡ Brit. Assn. Rept., 1863, p. 545.

§ B. A. Report, 1863, p. 626. *Id.* 664, 666, and 676.

In connection with the foregoing on the relations and variations of the west American forms of *Siphonaria*, it will be found on examination that the species or forms of other faunal regions, more or less remote, exhibit the same characters of variation, if not as extreme, nevertheless in a greater or less degree. For this purpose among numbers of specimens compare *S. brunnea* Hauley from Bermuda, etc. (Jones); make a similar comparison with *S. leucopleura* Gmelin from the Viti Islands.

Family TEREBRIDÆ.

TEREBRA (MYURELLA) VARIEGATA, Gray.

Many examples. San Jose Island (No. 56297, U. S. N. M.), La Paz (No. 101719, U. S. N. M.).

The specimens from the first locality are all young shells. Capt. Forrer also reported the above species from La Paz, where Fisher collected a varietal form (No. 101720, U. S. N. M.).

TEREBRA (SUBULA) STRIGATA, Sowerby.

= *Buccinum elongatum*, WOOD. + *T. zebra*, KIENER. + *T. flammea*, LESSON.

One specimen, beach; Tres Marias.

Rarely known to occur so far to the north; "common at Panama."* Dr. Jones collected two examples at Payta, Peru, and Cuning collected it at the Galapagos.

Family CONIDÆ.

CONUS DALLI, Stearns.

Seven examples.

Tres Marias, Maria Madre (Nos. 37417, 37418, U. S. N. M.). Since describing this form in April, 1873,† numerous specimens have passed under my examination, and confirm the conviction which led me at the time to regard this embroidered cone of the Mazatlan province as a new species. I see no necessity for modifying the diagnosis or the comments published at that time other than to add what is herein written.

In the collection of Mr. Fred. L. Button, of Oakland, Cal., is a remarkably fine series of young shells which are even more characteristic and distinct from any other of the embroidered cones than are the average adults of *C. Dalli* from *C. textile*, etc., which it occasionally somewhat resembles in pattern and color of markings. Mr. Fisher collected two living and several beach examples at the island of Maria Madre, the principal of the Tres Marias group. The largest, though somewhat rubbed and worn at each extremity, measures long. 2.35, lat. 1.29 inches; if perfect the length would be not less 2.65 inches.

Prof. Verrill refers, probably, to this shell in his "Contributions to

* Hinds, in Proc. Zool. Soc., 1843, p. 160.

† Proc. Cal. Acad. Sciences.

Zoology, etc.," No. vi, in Am. Jour. Sci. and Arts, Vol. XLIX, March, 1870, p. 227.

CONUS VITTATUS, Lamarek.

Five specimens, Tres Marias (No. 88312, U. S. N. M.).

The National collection contains further examples of this beautiful species. Mr. Fisher's are of the beautiful pink variety, and his shells range from juniors to adults.

Fine large specimens of the purple colored shells from Panama are in the collection (No. 37435, U. S. N. M.). These were collected by Bridges.

CONUS PURPURASCENS, Broderip.

Numerous specimens.

San Josef Island; Port Escondido (No. 37410, U. S. N. M.); Los Animas Bay (No. 37416, U. S. N. M.); Angeles Bay; Tres Marias (No. 37415, U. S. N. M.); also from Sta. Margarita Island (No. 10239, U. S. N. M.). The *Albatross* collectors obtained numerous examples on the beach at the latter place.

CONUS PURPURASCENS, Broderip.

Var. ? = *scalptus*, REEVE.

One example (No. 37407, U. S. N. M.).

The above single specimen was in the Stearns collection from Acapulco. Reeve's species is apparently a variety of *purpurascens*.

CONUS GLADIATOR, Broderip.

Three examples, living. Tres Marias (No. 37438, U. S. N. M.).

In no respect varying from Panama specimens collected by the late Thomas Bridges.

CONUS BRUNNEUS, Wood.

Two examples.

Tres Marias (No. 37445, U. S. N. M.). Altata (No. 37447, U. S. N. M.). Mr. Fisher's specimens of this species were in fine condition and characteristic. The Museum also contains three other examples from latter place.

CONUS BRUNNEUS, Wood.

Var. = *tiaratus*, BRODERIP.

Two specimens.

Tres Marias (No. 37449, U. S. N. M.). Found with the typical *brunneus* at the same time and in the same place. Agrees with Reeve's figure, Conch. Icon., 143. Reeve regarded it as a variety of the Indo-Pacific *C. minimus* which is found at the Navigator Islands (Upolu) and in the Viti group still further to the southwest, which implies that the suite of *C. brunneus* examined by Reeve was rather limited in number of individuals. See remarks in this connection in my paper on "The

Mollusk fauna of the Galapagos Islands, etc.," Proc. U. S. Nat. Mus., Vol. XVI, pp. 384-385.

CONUS NUX, Broderip.

Five specimens.

Port Escondido and Tres Marias (No. 37458, U. S. N. M.). Santa Margarita Island (1 specimen), *Albatross*.

CONUS PRINCEPS, Linnaeus.

A few specimens, Port Escondido (No. 37402, U. S. N. M.); Tres Marias (No. 37401, U. S. N. M.).

Mr. Fisher obtained a few examples of this beautiful shell at the foregoing places. He found them "attached to coral blocks," at Port Escondido; several examples from Carmen Island were received from the Stearns collection (No. 37403, U. S. N. M.), and a rare variety without the usual linear markings, from the same collection, detected at Panama by the well-known collector, Thomas Bridges (No. 37404, U. S. N. M.).

CONUS REGULARIS, Sowerby.

Var. = *C. monilifer*, BRODERIP.

A few examples.

Port Escondido (No. 37391, U. S. N. M.); this form is found also at Carmen Island (No. 37394, U. S. N. M.); and a variety at Pichilínque Island (No. 37392, U. S. N. M.).

CONUS DISPAR, Sowerby.

Var. = *C. monilifer*, BRODERIP, var.

Two examples, Boca de los Piedras (No. 37437, U. S. N. M.).

CONUS ARCHON, Broderip.

Three examples (No. 37397, U. S. N. M.); Manzanillo.

CONUS LUCIDUS, Mawe.

Two specimens; beach. Sta. Margarita Island; *Albatross*. Ranges southerly to the Galapagos Islands.

CONUS INTERRUPTUS, Broderip.

Three specimens, San Lucas Cove; Angeles Bay (No. 37423, U. S. N. M.).

CONUS CALIFORNICUS, Hinds.

One fresh example, Ballenas Bay; *Albatross*.

Family PLEUROTOMIDÆ.

PLEUROTOMA PICTA, Beck.

Four specimens; dredged. San Lucas Cove (No. 55241, U. S. N. M.). The above vary in length from $1\frac{1}{2}$ to $2\frac{3}{8}$ inches; this is a keeled

form, the peripheral carina being the most prominent; between the keels the surface is finely spirally threaded.

PLEUROTOMA (SURCULA) FUNICULATA, Valenciennes.

One specimen at each place.

San Lucas Cove (No. 55235, U. S. N. M.); Loreto. A fine, large, dark, chocolate-colored living example, 2.49 inches in length by .84 inch in breadth, was found, with many other pleurotomids, as above. Though not a rare form, it is apparently less common than its near relative, *P. olivacea* Sby. *P. funiculata*, though a less robust shell and not as coarsely sculptured as *olivacea*, exhibits in a striking degree the characteristic sculpture of *olivacea*; it is generally darker colored, though frequently of an olive green or greenish clay color, sometimes yellowish brown and again dark chocolate. The color in many of the species is so exceedingly variable as to be of little value as a specific distinction.

PLEUROTOMA (SURCULA) OLIVACEA, Sowerby.

One specimen (No. 55233, U. S. N. M.). Boca de los Piedras.

An adolescent example, dredged at the above place, .94 inch length, of a clear white, without epidermis.

PLEUROTOMA (SURCULA) TUBERCULIFERA, Brod. and Sby.

One specimen. San Lucas Cove (No. 55228, U. S. N. M.).

An exceedingly fine example of this strongly characterized species was obtained with the dredge. It is a rare form and seldom met with in collections.

PLEUROTOMA (SURCULA) MACULOSA, Sowerby.

Five examples dredged (No. 55259, U. S. N. M.). San Lucas Cove. One of these was a fresh, perfect shell.

PLEUROTOMA (DRILLIA) UNIMACULATA, Sowerby.

One specimen. San Lucas Cove (No. 55239, U. S. N. M.).

One example of the above was collected at this place, which seems to be rather the metropolis of pleurotomid forms in this general region. It closely resembles *echinatus* Lam., said to come from New Guinea. *P. unimaculata* is a narrower shell, and has heretofore been credited to the west coast of Central America. They both seem to be very close to the *P. gibbosa* of Kiener. The specimen under review is much nearer to *echinata* Lam. than to Kiener's *gibbosa*, as these two species are represented in the figures given by Chenu, Manual, Vol. I, figures 646 and 650. *Unimaculata* is an unfortunate name, as names based on color markings frequently prove to be; for in the instance before me, there is not only a large brownish spot on the basal whorl, but all of the numer-

ous nodes are spotted above and below, and there are revolving bands of the same color, especially seen on the basal volution.

PLEUROTOMA (DRILLIA) INCRASSATA, Sowerby.

= *D. Botta*, Val., TRYON.

One example from each locality.

Mazatlan, Henry Edwards; San Lucas Cove, Fisher (No. 55252, U. S. N. M.).

The Mazatlan example was collected and presented to the writer by his esteemed friend, the late Henry Edwards, so well known as an excellent entomologist and actor.

(His magnificent collection of insects has recently become the property of the American Museum of Natural History, New York.)

PLEUROTOMA (DRILLIA) MAURA, Sowerby.

Several specimens.

San Lucas Cove, dredged off San Marcos Island (No. 55237, U. S. N. M.).

Five examples, imperfect and dead, were obtained by dredging at this place. The largest measures 2.50 long., lat., .63, aperture 1.16 inches; the others, without making allowance for the erosion of the apex, measure, respectively, 2.09, 2.06, 1.94, and 1.84 long. inches. A comparison of the specimens shows that they run quite closely in sculpture, varying but little; in color they range, as do several of the related forms, from dark chocolate to a yellowish or sienna-brown. The late Mr. Tryon kindly compared the above with the specimens in the Philadelphia Academy's collection, and returned the following note:

"*Pl. maura*, Sowb. Reeve, sp. 47, 'Isle of La Plata;' and exactly like a specimen in our museum received from Sowerby."

Worn specimens sometimes exhibit a whitish line following the suture, on the upper whorls and just below the knobs on the body whorl. Reeve gives a figure of this species in his *Conchologia Systematica*, but the fine sculpture shown in said figure is not so clearly exhibited in heavy adult specimens.

Family CANCELLARIIDÆ.

CANCELLARIA (APHERA) TESSELLATA, Sowerby.

Several examples. La Paz Harbor, on a small island (No. 46273, U. S. N. M.).

Many specimens of this rare and peculiar form were obtained as above indicated by Mr. Fisher. The figure No. 1841 in Chenu's Manual, Vol. I, is apparently drawn from a young specimen.

Family OLIVIDÆ.

OLIVA VENULATA, Lamarck.

Numerous examples.

(Nos. 32401, 32402, 32416, 32431, U. S. N. M.) La Paz; Los Animas

Bay; Mulege Bay and Tres Marias. Capt. Forrer collected the above at La Paz; Loreto, Gabb.

This species exhibits extreme variation. In fact, the *Olives* from the Gulf region with the exception of two or three species are not easy to determine. Reeve makes the above as well as *O. araneosa* Lam., *O. Timorea*, *O. obesina*, and *O. pindarina* as synonyms of *O. reticularis*, the well-known Antillean species. I have never met with an example from the West coast that so closely resembled *reticularis* as to suggest such a connection. Carpenter makes *O. Melchersi* Mke., 1851, include *O. angulata* junior, *O. subangulata*, *O. Cumingii*, and *O. polpaster*. His *O. intertincta* is nothing but a variety of *Melchersi* and three specimens recorded by him as "*? intertincta*" were found upon examination to be, (1) *elegans*, and (2) *irisans*, both Indo-Pacific forms. I am quite sure, however, that this must have been in some way a blunder on the part of an assistant. The La Paz examples (No. 32402, U. S. N. M.) are typical. *O. renulata* runs all the way from closely reticulated zigzag waves or Vs on a lightish warm ground with a purple or brownish-purple stain on the terminal part of the columella, to shells that are a warm cream-yellow, sometimes without any of the V-shaped pencilings and sometimes with the same, but subordinated more or less to the general yellowish tone of the surface. Again the Vs are absolutely wanting and the markings are longitudinal, having somewhat of a ligneous aspect, resembling the graining of wood, with darker umber-colored zones blending and softening down to the lighter tint of the ground work or general color. Examples thus colored are the *lignicola* of Reeve (Mus. Steere), and the same author's *O. Cumingii* is still another aspect. The opposite extreme of coloration is seen in the beautiful dark, nearly black variety which has received the name of *oriole*. In these the Vs can generally be seen under the rich glaze that characterizes the numerous forms and varieties of this so-called species. Often in the point of the VVs, there is a nebulous roundish spot, such as would occur in painting, by the paint or color running off of the brush and filling up the sharp angle on the inner side of the point of the V. This gives a beautiful spotted effect in some examples, and occurs as a feature more or less conspicuous in many of the West Coast olives. The examples from Los Animas Bay (No. 32438, U. S. N. M.) suggest *Julietta* by their dotted flames. At Boca de los Piedras, Fisher obtained numerous examples (No. 32416, U. S. N. M.) of the short, rather stumpy, light-colored variety, with rather obscure sienna-yellow markings, (VVs) on a rich creamy yellow ground. Carpenter has compared this variety to the *reticularis* of the Caribbean region, but the two are readily separable by any moderately intelligent expert. Fisher's Boca shells vary in size from .36 minimum to 1.12 maximum in length. The purplish chocolate stain at the base of the columella is quite a

permanent character and is present in the smallest as well as the largest individuals.

OLIVA ANGULATA, Lamarck.

Two specimens.

La Paz (No. 32420, U. S. N. M.). Sta. Margarita Island (2 beach), *Albatross*. Small examples sometimes exhibit a facies suggestive of *O. polpaster* Duclos, or it may be said on the other side that occasional heavy examples of *O. polpaster* resemble young individuals of *O. angulata*.

OLIVA SPLENDIDULA, Sowerby.

Two specimens. Tres Marias.

One of Mr. Fisher's specimens measured 2 inches in length. This is an exceedingly beautiful as well as a rare species, and easily distinguishable from any other of the genus. Of the large and beautiful *Oliva porphyrea*, so highly prized by amateurs, and frequently used as a mantel ornament, Mr. Fisher did not obtain any examples. It is quite common, compared with *splendidula*.

OLIVA SUBANGULATA, Philippi.

Three specimens. La Paz; Mulege Bay.

OLIVANCILLARIA (AGARONIA) TESTACEA, Lamarck.

Two examples. Gulf of California (No. 32452, U. S. N. M.).

OLIVELLA GRACILIS, Gray.

Three young specimens. Mulege Bay (No. 47257, U. S. N. M.).

OLIVELLA UNDATELLA, Lamarck.

Five specimens. Altata (No. 47222, U. S. N. M.).

OLIVELLA DAMA, Mawe.

Numerous examples.

Mulege Bay (No. 47230, U. S. N. M.); Los Animas Bay; Loreto; Angeles Bay; San Lucas Cove; La Paz.

OLIVELLA CYANEA, Reeve.

= *O. pulchana*, ORBIGNY, Reeve's Monog., Pl. XXIV, figs 70^a, 70^b, 70^c.

Abundant, living. Tres Marias (No. 47254, U. S. N. M.).

Family HARPIDÆ.

HARPA CRENATA, Swainson.

[not *H. crenata* GRAY or *H. crenata*, REEVE, of authors.]

= *H. scriba*, VAL. + *H. gracilis*, B. & S. + *H. rosea crenata*, GRAY. + *Buccinum roseum*, WOOD. + *Buccinum minus*, WOOD; [not *Harpa minor*, MART.] + *H. Riviolina*, LESSON. + *H. rosea*, var. KIENER. + *H. Mexicana*? Jay's Cat. + *H. testudinalis*? Id.

Numerous specimens. Tres Marias.

Collected here by Fisher; previously received by me from the islands in all stages of growth. *Harpa rosea*, with which this Gulf shell is sometimes confounded, is an African species, which in maturity nearly always exhibits the rose-pink color which is generally confined to the earlier stages of *H. crenata*; in young shells of the latter it is apparently a constant character. The ribs in *crenata* are much less developed than in the other Harps; fresh living shells are frequently met with of a dull reddish-ashen surface, but very slightly enameled, while the delicate waved markings are nearly obsolete. Highly colored and glossy individuals are very beautiful, though even in such examples the enamel is less brilliant than in most of the species. Carpenter (in B. A. Report, 1863, p. 122), referring to the prices of certain West American shells as noted in the British Museum copy of the "Tankerville catalogue," 1825, quotes *H. crenata* 45s. = \$11.25, and *Conus regius* (= *C. princeps*) is given at £5 5s. = \$26.25. The peculiar *Lucina* (*Miltha*) *Childreni* Gray, a form that is rare even to this day, is quoted at £10 10s. = \$52.50.

Family MARGINELLIDÆ.

VOLVARINA VARIA, Sowerby.

One example. Mulege Bay (No. 12260, U. S. N. M.).

Although Fisher's collection contained only one, a dead shell, it is not an uncommon form from the Gulf region. It is credited by Carpenter to Cape St. Lucas and to the West Indies.

Family VOLUTIDÆ.

VOLUTA (ENLÆTA) CUMINGII, Broderip.

+ *E. Pedersenii*, VERRILL.

Several specimens. San Lucas Cove (No. 46380, U. S. N. M.).

Mr. Fisher collected many examples of this interesting form at the above place, which well illustrate the differentiation between the mature and adolescent stages of growth. Numerous specimens collected by various parties or procured from sailors employed in the Gulf trade especially during the Franco-Mexican war, when the commerce between San Francisco and west Mexican Gulf ports was at its height, have passed under my examination. Prof. Verrill many years ago described *E. Pedersenii* from specimens collected by Capt. Pedersen, but I am inclined to regard it as only a variety of *Cumingii*. *Voluta Cumingii* has since been detected as far north as Magdalena Bay (No. 102548, U. S. N. M.) by Mr. C. H. Townsend, of the U. S. Fish Commission.

Family TURBINELLIDÆ.

MELONGENA (SOLENOSTEIRA) MODIFICATA, Reeve.

= *Siphonalia modificata*, REEVE, and of authors.

Many specimens.

La Paz; San Lucas Cove; Los Animas Bay; Angeles Island; Boca de los Piedras; Tres Marias (No. 46754, U. S. N. M.).

As to the relationship of the above form see Dall's remarks in the Transactions of the Wagner Institute, Philadelphia, volume 3, part 1, p. 122, August, 1890, and my paper on Dr. Jones' collection of South American shells in Vol. XIV, Proc. U. S. National Museum, p. 323.

Family MITRIDÆ.

MITRA LENS, Wood.

Common, between tide marks. La Paz; Tres Marias.

MITRA EFFUSA, Swainson.

Rare. A solitary specimen.

Mulege Bay (No. 46409, U. S. N. M.); Dr. Gabb also collected an example somewhere on the Gulf side of the peninsula.

MITRA (CANCILLA) SULCATA, Swainson.

= *M. gigantea*, SWAINSON. + *M. Hindsii*, REEVE. + *M. attenuata*, SWAINSON.
+ *M. funiculata*, REEVE.

Several specimens. San Lucas Cove (Nos. 46405, 46406, U. S. N. M.).

The synonymy as above is given by Tryon. (Manual, Monograph of *Mitridæ*, p. 139.)

MITRA (STRIGATELLA) TRISTIS, Broderip.

Numerous fine specimens.

Mulege Bay (No. 46393, U. S. N. M.); Los Animas Bay (No. 46390, U. S. N. M.).

Fisher's specimens were for the most part small or immature; his largest example measured long. 1.17, lat. .45 inch.

Family FASCIOLARIIDÆ.

LATIRUS (LEUCOZONIA) CINGULATA, Lamarck.

One example, Tres Marias (No. 47124, U. S. N. M.).

Occurs also at Mazatlan in the Gulf, thence southward to Panama where it has been collected by Cuming, C. B. Adams, Bridges, and others. This form varies considerably in height of the spire as well as in the length of the horn. It has been erroneously placed in the genus *Monoceros*, Lam. (= *Acanthina*, Fischer, in Adams genera), also by C. B. Adams in his "Shells of Panama," and by Chenu (Manual, tome 1, p. 169, fig. 832). Calkins in his Catalogue of the Marine Shells of Florida, etc., Proc. Davenport Acad. Nat. Sci., March 29, 1878, has erroneously included this species, confounding it quite likely through general similarity of name with the very different Caribbean *Latirus cingulifera*, Lam., and further added to the confusion by including the

"genus *Monoceras*, Lam.," in his catalogue and placing *Leucozonia* as a subgenus thereunder. He remarks that "it is a Panama species found by me at the southern extremity of Florida."

The necessity for calling attention to this unfortunate "muddle" again at this late day, is apparent to any student who has observed how persistently errors of this class find a lodgment in the literature, long after they have been pointed out or exposed. It is well known that neither *Leucozonia cingulata* nor any representative of the group *Monoceros* have up to this time been detected on the Atlantic side of the continents, and it is particularly remarkable so far as regards the latter genus.

LATIRUS CERATUS, Wood.

Numerous specimens, living. Tres Marias (No. 47125, U. S. N. M.).

Many fine examples were detected by Mr. Fisher living in the crevices of the ledges and dead on the beaches. The average dimensions of the Fisher shells is, long. 2.69, lat. 1.44 inches.

FUSUS DUPETITHOUARSII, Kiener.

Many specimens.

La Paz and San Lucas Cove; Loreto (No. 32336, U. S. N. M.); Carmen Island (No. 32334, U. S. N. M.). Of this fine species the examples range from 1.76 to 7.50 inches in length. Compared with specimens of *F. multicarinatus* from Yokohama, a form regarded by the late Mr. Tryon as the same as *F. Reeveanus* Phil., and which he further suggests as the same as *F. Nova-Hollandiae* Reeve., I find the sculpture rather finer and the canal (not a fixed character in the spindle shells) proportionally longer in the Japanese species. Though running very close, the two may be regarded as valid species. In some individuals of the Gulf form the longitudinal ribs which extend from suture to suture on the upper whorls become reduced to mere tubercles on the periphery of the two last or larger whorls.

FUSUS AMBUSTUS, Gould.

Six examples.

San Lucas Cove (No. 32340, U. S. N. M.).

Since the publication of Mr. Dall's paper* "On the Californian species of *Fusus*" and Mr. Tryon's Monograph,† I have carefully examined the various species included therein that inhabit the region referred to in this paper. Mr. Fisher collected eleven specimens of the form now regarded as *ambustus*. In the various related material before me, I found but little difficulty in segregating these. The two largest meas-

* Proc. Cal. Acad. Sci., March 19, 1877.

† Manual of Conch., vol. III, pp. 58-64.

ure respectively 2 and 2.05 inches in length; placed side by side with examples of *F. Dupethithouarsii* of same length it will be seen that the former is generally of slenderer habit and a more graceful form, as Tryon remarks. Fine mature specimens are often bluish-white inside of the aperture.

FUSUS CINEREUS, Reeve.

Several specimens. La Paz (No. 32354, U. S. N. M.); San Lucas Cove (No. 32353, U. S. N. M.).

The three La Paz shells are small, of the four Cove specimens, two are adult and two juniors. Rather a rare shell in collections. The National Collection contains examples received from other sources. From Panama, collected by Bridges, several examples are registered under the numbers 32356 and 32357. It is found at other places in the Gulf region.

PISANIA (TRITONIDEA) INSIGNIS, Reeve.

= *Pisania insignis*, REEVE, in S. I. Check List 1860, and Carpenter's Mazatlan Catalogue.

Not common; one specimen. San Lucas Cove (No. 46736, U. S. N. M.).

The Fisher example from the above locality is destitute of the longitudinal ribs. Sta. Margarita Island (two beach shells), *Albatross*.

PISANIA (TRITONIDEA) GEMMATA, Reeve.

Three examples. Mazatlan (No. 46746, U. S. N. M.), Henry Edwards. This species appears to be of infrequent occurrence.

ENGINA CARBONARIA, Reeve.

Three juniors, live shells. Mulege Bay (No. 46688, U. S. N. M.). A rare species.

ENGINA CARBONARIA, Reeve; var. FUSIFORMIS, Stearns.

One specimen, living, dredged. San Lucas Cove (No. 102620, U. S. N. M.).

An elongated rather coarsely sculptured shell, quite deceptive at first sight. Outer lip simple, as if immature; in strong contrast with the ordinary chunky, solid, heavy-lipped type of the species.

MACRON ÆTHIOPS, Reeve.

+ *M. Kellettii*, HINDS; Stearns, Proc. Phil. Acad. Nat. Sciences, pp. 397, 398, Pl. VII, figs. 3, 4, 5.

Common; fine specimens. San Quentin Bay (Nos. 60074, 60075, 60076, U. S. N. M.).

Numerous living examples of this variable shell were collected by Mr. Fisher on "mud flats" in said bay, which indisputably connect the above forms. Reeve's description and figure indicate an example in

which the entire surface was broadly and deeply channeled or grooved, agreeing perfectly with specimens in the National collection (60074) which measure 2.9 inches in length by 1.92 inch in width; from this size younger examples as small as 1 inch in length by 0.58 inch in width (the outer lip thin at this age), show the same characters. In *Kellettii* (60076) Hinds' form, the shell exhibits only three of these channels, near the base of the body whorl. Mr. Fisher's specimens prove that the grooving is an uncertain character. The number of individuals collected by him was fortunately ample enough to settle all doubts and prove that the two forms as above should be united under one specific name; as Mr. Reeve's appears to be the first in order of time, it must be adopted. The National Museum series exhibits all of the intermediate forms or varieties; the connecting links (60075) were received not only with the Fisher shells but from Hemphill and other sources.

The shells of the foregoing when living or fresh are covered with a thick blackish epidermis, which is apt to peel or flake off when very dry. The epidermis has the same character in the rare *Mitra Belcheri*, in common with other West American related forms, and we may presume it lives in similar muddy stations.

Examples of *M. Ethiops* of the form that is grooved throughout have been collected at Cerros or Cedros Island, on the ocean side of Lower California; it was collected years ago by Capt. Scammon, in Scammon's lagoon. The late Prof. W. M. Gabb found it at San Juanico, on the ocean side of the peninsula, in 1867, and Henry Hemphill has contributed specimens to the National Museum, collected by him at San Ignacio lagoon (No. 105432, U. S. N. M.); Manuel lagoon (No. 105433, U. S. N. M.); Point Abreogos "around rocks" (No. 105434, U. S. N. M.) also at Scammon's lagoon (No. 105428, U. S. N. M.). Ballenas Bay (No. 102256, U. S. N. M.), U. S. Fish Commission, *Albatross*.

Family NASSIDÆ.

NASSA TEGULA, Reeve.

= *N. tiarula*, KIENER.

Abundant.

La Paz; Mulege Bay (No. 46616, U. S. N. M.). Los Animas Bay (No. 46615, U. S. N. M.); Loreto. This variable species is exceedingly numerous at many places in the Gulf region and elsewhere on the shores of Lower California; it exhibits many interesting and suggestive varieties. The usual Gulf form is of a pale, dingy yellow or yellowish-white color, in some specimens running into an ashen-blue on the last half of the final whorl, with sometimes two, more rarely, three dark color bands, the upper one interrupted by the sculpture, which latter consists of 8 or 9 strong longitudinal ribs, interrupted and broken into nodules by a transverse groove, just below the suture; the ribs evanesce on the last third of the basal whorl, showing three or four strong nodules

only, with a nearly smooth area below. Otherwise sculptured with ten or more sharp, revolving striae; the varying prominence of the longitudinal and transverse sculpture, combined with variableness in form—some shells being robust or “chunky,” others elongated—produces, as may be supposed, many varieties. A dwarfed form is often met with. A variety occasionally noticed resembles one aspect of the Gulf of Mexico *Nassa vibex*; specimens of these occur at La Paz.

In the more northerly examples from San Diego and thereabout the longitudinal and transverse sculpture is less variable, being more nearly equal in prominence; the shells are darker colored, with usually a conspicuous dark spot over the mouth. Some of the San Diego specimens closely resemble certain occasional individuals of *Nassa lirata* Dkr., from Japan. In an interesting paper by F. P. Marat (May, 1876), “On the variation of sculpture exhibited in the shells of the Genus *Nassa*,” the author remarks:

N. tegula (Reeve pl. 15, fig. 99, *a* and *b*), is simply coronated at the sutures, but when the ribs are completed it becomes the *N. coronula*, *A. Ad.* Some of my varieties are only half ribbed, and others are scarcely ribbed beyond the tubercles.

NASSA CORPULENTA, C. B. Adams.

Several specimens. Tres Marias (No. 46606, U. S. N. M.). A rather rare shell.

NASSA LUTEOSTOMA, Broderip and Sowerby.

Several examples.

La Paz; St. Josef Island; Los Animas Bay (No. 46608, U. S. N. M.); Francisquita Bay; Angeles Bay; Boca de los Piedras; Tres Marias.

NASSA COMPLANATA, Powis.

= *N. scabriuscula*, C. B. Adams.

Numerous (Nos. 46644, 46646, U. S. N. M.). Los Animas Bay; Mulege Bay.

NASSA COMPLANATA; var. MAJOR, Stearns.

Abundant (No. 75155, U. S. N. M.). Los Animas Bay.

The above is a much larger form than the average of typical *complanata* and much coarser in sculpture, and some of the examples are as large as small specimens of *tegula*; it suggests on a casual glance *N. vibex*, of Floridan waters.

NASSA BRUNNEOSTOMA, Stearns.

Nassa brunneostoma, STEARNS, Nautilus, May, 1893; Proc. U. S. Nat. Museum, Vol. XVI, 1893, pp. 344, 345.

Abundant.

Gulf of California near the mouth of the Colorado River (No. 37239, U. S. N. M.); Guaymas (Nos. 23721, 55951, U. S. N. M.).

Collected by Dr. Edward Palmer. An exceedingly pretty and characteristic species, allied in a general way to Reeve's *tegula* and Powis's *complanata*.

Family C O L U M B E L L I D Æ.

COLUMBELLA ILEMASTOMA, Sowerby.

Not common; beach. San Lucas Cove.

COLUMBELLA FUSCATA, Sowerby.

Common, living. Tres Marias; Loreto.

COLUMBELLA MAJOR, Sowerby.

Common, living. Port Escondido; Tres Marias and elsewhere. Fisher's shells from the first locality are of the small variety.

COLUMBELLA (ANACHIS) CORONATA, Sowerby

A few examples. Mulege Bay; Tres Marias.

Compared with related forms this species is apparently rather rare, not only at the above place, but throughout the Gulf region.

COLUMBELLA (ANACHIS) GASKOINII, Carpenter.

A. tenuata, PHILIPPI.

Examples (No. 48256, U. S. N. M.). Mazatlan, Henry Edwards, January, 1873. A rare and very pretty species.

COLUMBELLA (ANACHIS ?) PARVA, Sowerby.

Two specimens. Mazatlan, Hy. Edwards (No. 48270, U. S. N. M.).

COLUMBELLA (ANACHIS) LYRATA, Sowerby.

Examples, beach. Loreto.

COLUMBELLA (ANACHIS) NIGRICANS, Sowerby.

Examples. Loreto.

COLUMBELLA (ANACHIS) SERRATA, Carpenter.

Beach specimens. Loreto.

COLUMBELLA (NITIDELLA) CRIBRARIA, Lamarck.

Common.

La Paz; San Lucas Cove; Los Animas Bay, Angeles Island; Tres Marias (Nos. 48333, 48334, U. S. N. M.); Boca de los Piedras.

Two well-marked varieties, one of a dark chocolate-red, with light spots; the other sienna yellow, with light spots; the latter appear to be more truncated than the first; both of them are on an average rather larger than the usual run of Nicaraguan examples. Occurs also at

Panama, the Galapagos Islands, on the Florida Keys, in the Antilles, and was found to be common at Porto Grande (No. 125323, U. S. N. M.), Cape de Verde Islands by the Eclipse Expedition to West Africa, in 1889.

COLUMBELLA (META) CEDONULLI, Reeve.

= *Couella cedonulli*, of authors.

Numerous examples.

Port Escondido (No. 48318, U. S. N. M.); San Josef Island; Loreto; San Lucas Cove; Los Animas Bay; Mulege Bay; Tres Marias, also at Carmen Island. This form is conspicuous from its numerous and frequently beautiful color varieties. A portion of the Fisher specimens came from the first locality, a single colony. They were all of the same general color, being blotched and spotted with dark brown and yellowish white in varying proportions. In fresh specimens the epidermis around the spire has sometimes a plaited and tufted aspect coincident with the incremental lines.

COLUMBELLA (STROMBINA) MACULOSA, Sowerby.

Seven specimens.

Tres Marias (No. 48306, U. S. N. M.); Loreto; Carmen Island (No. 48303, U. S. N. M.); fine examples of this graceful shell were collected by Mr. Fisher, in some instances measuring 1.35 inches in length. It is the commonest species of the genus on the West coast.

Family MURICIDÆ.

Subfamily MURICINÆ.

MUREX PLICATUS, Sowerby.

Three examples.

La Paz (No. 46757, U. S. N. M.); San Lucas Cove; Loreto; Mulege Bay (No. 46758, U. S. N. M.).

Capt. Forrer obtained this species at La Paz.

MUREX (CHICOREUS) PALMA-ROSÆ MEXICANA, Stearns.

Chicoreus palma-rosæ Mexicana, STEARNS, Proc. U. S. Nat. Museum, Vol. XVI, 1893, pp. 345-346.

? = *M. palma-rosæ*, LAMARCK, var.

? = *M. affinis*, REEVE.

? = *M. Steerii*, REEVE.

A single example (No. 46803, U. S. N. M.); in fair condition. Tres Marias.

MUREX (PHYLLONOTUS) BICOLOR, Valenciennes.

Young shells; several examples. La Paz and elsewhere.

The specimens submitted to me by Mr. Fisher were young fresh

examples only from 1.14 to 1.23 inches in length. At this early stage it is nearly impossible to determine under which of the following specific names to place them. While I am inclined to regard them as the juniors of *bicolor*, first, from the general aspect leaning toward said species, and, second, because *bicolor* is the more abundant of the three, there is, nevertheless, a reasonable doubt. We have as closely related forms, *P. bicolor* Val., *P. brassica* Lam., and *P. erythrostoma* Swains.

The latter is apparently a pale variety of *P. bicolor*, of which numerous examples were in my collection and many more have passed through my hands.

In paragraph 60, on page 559 of Carpenter's "Report (1863) to the British Association," he refers to Sowerby's monograph with comments thus "*?=bicolor*, var." which it may be. I am inclined to regard it as a variety of *M. (Phyllonotus) brassica*.

MUREX (PHYLLONOTUS) PRINCEPS, Broderip.

Single example. La Paz (No. 47172, U. S. N. M.).

The solitary specimen before me is only 1.10 inches in length. The sharpness of sculpture and the elaborate arborescent fringing of the varices in adolescent specimens produce a general effect, which, when compared with heavy adult individuals, is quite likely to mislead those who are not familiar with the West American species in their various stages, and the character of their variation. It is not unlikely that many of the species made by the older authors are really immature varietal forms or geographical varieties. *Murex nitidus*, Brod. (Conch. Ills., fig. 4), Sowerby remarks as being "probably a variety of the last [*M. princeps*] in a young state."

The late Thomas Bridges collected numerous specimens of *princeps* on the coast of Nicaragua at San Juan del Sur, or in that immediate neighborhood. Prof. C. B. Adams did not report it from Panama in the catalogue of his collection from that place. The Nicaraguan examples, so far as I have observed, differ from those of the Gulf region in the same general way as do the adult specimens of *P. radix* from Panama from the Gulf forms of the same which the late Dr. Carpenter catalogued in his "Mazatlan Mollusca" as "*P. nigrinus*, Meusch.," and in the S. I. check list as "*P. nigrinus*, Phil." The southern shells of both *princeps* and *radix* are generally more stumpy and solid. Though some of Prof. Adams's specimens of *P. radix*, Carpenter says in his review* of Adams's catalogue, "are remarkably fine, more nearly resembling the Gulf *nigrinus* than the heavy stumpy shells usually seen, * * * *Phyllonotus radix* and *nigrinus* graduate into each other almost as freely as the latter does into *ambiguus*." The last is one of Mr. Reeve's species based on a variety of *radix*, which, being the older name, must stand, and includes also as synonyms *P. nigrinus*, Phil. of

* Proc. Zool. Society, London, June, 1863.

Meusch., and *P. ambiguus*, Reeve. The number of varices, though constant within certain limits, is not so persistent and rigid a character as to be of specific value as between the forms referred to by the authors above quoted, some of whom seem to have held rather arbitrary notions as to what constitute a species.

MUREX (PHYLLONOTUS) BRASSICA, Lamarck.

A few examples. Magdalena Bay; La Paz (No. 47172, U. S. N. M.). Mulege Bay.

MUREX (PHYLLONOTUS) RADIX, Gmelin.

Var. = *nitidas* BRODERIP.

+ *nigritus* MEUSCH.

+ *ambiguus* REEVE.

Two beach shells. Sta. Margarita Island, *Albatross*.

OCINEBRA LUGUBRIS, Sowerby.

Proc. Zool. Soc., London, 1832, p. 175.—Conch. Ill., fig. 26, REEVE, Icon. sp. 143.

Murex erinaceoides, VAL., Recueil d'observations, etc., II, 302, 1833. = *Murex Californicus*, HINDS, Proc. Zool. Soc., London, p. 128, 1843, Voyage Sulphur t. 3, f. 9, 10. = *Murex Californicus*, REEVE, Conch. Icon. sp. 144. = *Murex (Ocinebra) erinaceoides*, VAL. (= *M. Californicus*, HINDS), STEARNS, Proc. Phil. Acad., 1878, pp. 395-396.

La Paz, Fisher (No. 46767, U. S. N. M.). Attention is called to my remarks on the foregoing in the Proc. U. S. National Museum, Vol. XVI, 1893, pp. 346, 347.

OCINEBRA (MURICIDEA) SQUAMULIFER, Carpenter.

? = *M. fimbriata*, A. ADAMS, var.

Several fine examples (No. 46779, U. S. N. M.). Port Escondido; San Lucas Cove.

Very close to *M. hexagonus* Lam. Tryon remarks it is undoubtedly the same species. I have not seen a sufficient number of the Antillean form to hazard an opinion.

EUPLEURA MURICIFORMIS, Broderip.

Common.

San Lucas Cove, opposite Marcos Island (No. 32310, U. S. N. M.).

One example measures 1.64 inches in length.*

Subfamily PURPURINÆ.

PURPURA PATULA, Linnaeus.

Two examples. Tres Marias (No. 32141, U. S. N. M.); also Socorro Island (No. 32140, U. S. N. M.).

* In connection with this species attention is called to Dall's paper in the Proc. U. S. National Museum, Vol. XIV, pages 173-191, 1891.

This last was collected by the late A. J. Grayson, the well known ornithologist.

PURPURA COLUMELLARIS, Lamarck.

Many examples. Tres Marias (No. 32142, U. S. N. M.).

Very heavy solid specimens, of a dwarfed habit and rather elevated spire, of a total length of from only 1.03 to 1.05 inches, were collected at these islands, being about one-half of the size of usual adult examples, which measure long, .2 inches or over.

A variety intermediate between *columellaris* and *patula* is sometimes met with (No. 32143, U. S. N. M.). It is not so heavy or solid as the former and heavier than *patula*, with the protuberance on the columella less conspicuous than is usual in *columellaris*.

PURPURA KIOSQUIFORMIS, DUCLOS.

= *Cuma kiosquiformis*, DUCLOS and of authors.

One exceedingly fine specimen. Boca de los Piedras (No. 60065, U. S. N. M.).

The shells from the Gulf region compared with Panama examples appear to have a more regular growth; the pointed knobs are less produced, and the adults, average, of larger size. Henry Edwards collected some very fine specimens at Mazatlan, while at that place several years ago collecting insects; examples of these he kindly contributed to my collection.

PURPURA HIPPOCASTANEUM, Linnaeus.

One specimen living.* Mulege Bay (No. 89655, U. S. N. M.).

The black-mouthed variety generally known as *P. bitubercularis* Lamarck.

An Indo-Pacific species. How came it here?

The occurrence of *Cassis vibex* on the Tres Marias, beach, and subsequent detection at La Paz (crab shells), has led me to include the above Polynesian purpuroid in Fisher's list. Its occurrence here may be accidental.

PURPURA BISERIALIS, Blainville.

Numerous examples. Loreto, Gabb. Ballenas Bay; Sta. Margarita Island, *Albatross*.

The Santa Margarita specimens include both the coarsely-sculptured form and the variety, wherein the principal transverse ridges are hardly broken into knobs. This species seems to be very abundant at this place, and exhibits all the varieties to which Carpenter has referred in his Mazatlan Mollusca.

PURPURA TRISERIALIS, Blainville.

Four examples.

* Previously noted by me in Proc. U. S. Nat. Museum, Vol. XVI, 1893, p. 347.

Tres Marias (No. 32152, U. S. N. M.); La Paz, Capt. Forrer (No. 32151, U. S. N. M.); also at Sta. Margarita Island (beach) *Albatross*.

PURPURA TRIANGULARIS, Blainville.

Examples. Loreto.

MONOCERAS TUBERCULATUM, Gray.

+ *Purpura muricata*, GRAY.

One example from each of the following places:

Tres Marias, Fisher (No. 60012, U. S. N. M.), and La Paz, Capt. Forrer. Sta. Margarita Island, *Albatross*, three beach shells. This species ranges southerly as far as Peru and extends also to the Galapagos Islands. Two remarkable varietal specimens of this species have been brought to my notice by Miss Cooke, of San Diego. One of these is $4\frac{1}{2}$ inches long, the other nearly as large, and suggests a still greater range of variation approaching the species known as *M. grande*. The variability exhibited by different specimens in the prominence of the horn has been previously mentioned.

A young individual which I have examined, measuring only .76 inch in length shows the horn; in another over 2 inches in length it is barely perceptible. Gabb collected this at San Bruno, and two examples from this locality are contained in the U. S. Nat. Museum; (No. 32154.)

MONOCERAS LUGUBRIS, Sowerby.

Several specimens.

Tres Marias (No. 60017, U. S. N. M.). Ballenas Bay, *Albatross*, abundant; it occurs also at Sta. Margarita Island. Many examples of a rather elongated, less solid and robust form than those usually seen from other localities in the general region. These have a rich purple mouth merging into dark chocolate. The largest measured long., 1.05; lat., .58; long., .97; lat., .61; the latter the smallest. The above is rather a variable species.

SISTRUM FERRUGINEUM, Reeve.

Common. Point Escondido; St. Josef Island; Los Animas Bay; Loreto.

Subfamily CORALLIOPHILINÆ.

CORALLIOPHILA (RHIZOCHILUS) NUX, Reeve, ex Carpenter.

= *Murex nux*, REEVE, Conch. Icon. pl. 38, sp., 181. + *R. aspera*, REEVE. = *M. (Ocenebra) nux*, H. and A. ADAMS. Genera Vol. I, p. 75. = *Purpura costata*, BLAINVILLE. *Coralliophila costata*, BLAINVILLE; CARPENTER, Mazatlan shells, p. 484. = *Cuma costata*, AUCT.

Four examples (No. 32167, U. S. N. M.). St. Josef Island; San Lucas Cove; Tres Marias.

The spire which in young specimens is short becomes elevated

in adults, and shows three revolving keels or ribs on the basal whorl, varying in prominence in different individuals, and traversed and more or less interrupted by 11 to 12 longitudinal ribs, which, at the points of intersection with the transverse keels, produce moderately rough spinose processes; in fine and old specimens these are quite sharp, otherwise sculptured with narrow, close, scabrous revolving ribs. A rather rare form, undoubtedly purpuroid. Compare with *Purpura gallea* from Cuba. Large specimens look very much like some of the so-called Cunas. Tryon's figures do not represent such fine examples as these collected by Fisher, though the national collection contains specimens that agree with the figures referred to, that have been received from other sources.

Superfamily PTENOGLOSSA.

Family SCALIDÆ.

OPALIA CRENATOIDES, var. INSCULPTA, Carpenter.

One example. Angeles Bay (No. 46260, U. S. N. M.).

Superfamily TAENIOGLOSSA.

Family TRITONIDÆ.

TRITON (LAMPUSIA) VESTITUM, Hinds.

One specimen, dead. Tres Marias (No. 32329, U. S. N. M.); also Panama, T. Bridges (No. 32320, U. S. N. M.). Two examples.

Likely to be confounded with the Indo-Pacific *pileare*, which it much resembles. A rare species.

RANELLA NANA, Broderip and Sowerby.

REEVE, Conch. Icon; Monog. *Ranella*, Pl. VI, figs. 29a, 29b.

One specimen; San Lucas Cove (No. 32315, U. S. N. M.).

A rare species, heretofore reported from San Blas, Hinds; Mazatlan, Melchers; Panama Cuming; also at the latter place by C. B. Adams, who found two examples, both crab shells; one specimen in the Stearns collection was collected at Panama by the late Thomas Bridges (No. 32314, U. S. N. M.).

Family CASSIDIDÆ.

CASSIS (CASMARIA) VIBEX-MEXICANA, Stearns.

Casmaria vibex-mexicana, STEARNS, Proc. U. S. Nat. Museum, Vol. XVI, 1893, p. 348.

One example, a crab shell (No. 88831, U. S. N. M.); Maria Madre, Tres Marias; La Paz, Belding.

CASSIS (LEVENIA) COARCTATA, Sowerby.

Numerous specimens.

Tres Marias (No. 47146, U. S. N. M.). Sta. Margarita Island (common),

Albatross. This form is rather common in the Gulf of California region, but really fine examples are rare.

ONISCIDIA TUBERCULOSA, Reeve.

One example. Tres Marias (No. 47143, U. S. N. M.).

A common form in the Gulf region. Occurs also in the Galapagos Islands.

Family DOLIIDÆ.

DOLIUM (MALEA) RINGENS, Swainson.

One perfect example; many fragments.

Sta. Margarita Island, *Albatross*. The above example, though only $1\frac{3}{4}$ inches long, is mature. This species is apparently common at this place. It has been reported from the Galapagos Islands.

Family CYPRÆIDÆ.

CYPRÆA (LUPONIA) ISABELLA-MEXICANA, Stearns.

Luponia Isabella-Mexicana, STEARNS, Proc. U. S. Nat. Mus. 1893, pp. 348-349, fig. 5, pl. 50. = *C. controversa*, GRAY, STEARNS, in Proc. Phila. Acad. Nat. Sci. 1878, p. 399.

Several specimens. Tres Marias (Nos. 46581, 46582, U. S. N. M.).

CYPRÆA (LUPONIA) ALBUGINOSA, Mawe.

Several examples. Tres Marias, Fisher (No. 46587, U. S. N. M.). La Paz, Forrer. Fisher collected many fine living specimens at the former place.

CYPRÆA (LUPONIA) SOWERBYI, Kiener.

= *C. zonata*, LAMARCK.

Several specimens.

Port Escondido; Loreto; Los Animas Bay (No. 46593, U. S. N. M.). Santa Margarita Island (beach), *Albatross*.

Many fine examples were collected at the above places by Mr. Fisher. Adults vary in size from long .91 to 1.81 inches.

CYPRÆA (ARICIA) ARABICULA, Lamarck.

A few living specimens.

Port Escondido; and Maria Madre, Tres Marias. Extends southward to Acapulco, thence to Payta, South America.

CYPRÆA (TRIVIA) SANGUINEA, Gray.

Not common, beach. Tres Marias (No. 46307, U. S. N. M.).

This species has a southerly range as far as Panama and the Galapagos Islands.

CYPRÆA (TRIVIA) SOLANDRI, Gray.

A few examples.

Magdalena Bay; Loreto. Sta. Margarita Island, living, *Albatross*. Ranges from Santa Barbara Islands to Acapulco and Panama.?

CYPRÆA (TRIVIA) RADIANS, Lamarck.

A few specimens.

Tres Marias (No. 46320, U. S. N. M.); also from Altata, on the Gulf (No. 46321, U. S. N. M.), A. J. Gove. Reported from Guacomayo and said to extend to "Ecuador and Peru."

CYPRÆA (TRIVIA) PULLA, Gaskoine.

Rare, beach, three examples.

Tres Marias (No. 46312, U. S. N. M.); Mazatlan (No. 46313, U. S. N. M.).

The single specimen from Mazatlan was collected by the late Henry Edwards. A rare species. Also credited to the Galápagos Islands.

CYPRÆA (PUSTULARIA) PUSTULATA, Lamarck.

Six examples,

Tres Marias (No. 46334, U. S. N. M.); also Altata (No. 46335, U. S. N. M.), A. J. Gove. Ranges southerly to Acapulco and Panama.

ERATO COLUMBELLA, Menke.

Rare, living, two examples. Mulege Bay (No. 46346, U. S. N. M.).

This locality carries the above further up the Gulf than before reported. Its northerly limit appears to be Monterey, Cal. Occurs also at Acapulco, to the south.

Family STROMBIDÆ.

STROMBUS GALEATUS, Wood.

Three examples, immature, beach, fresh. Tres Marias (No. 55644, U. S. N. M.).

In the adolescent stage the above, like other strombs, resembles the cones. The young of this species, as seen in the foregoing example, is beautifully mottled with white, on a warm yellowish-brown ground. In point of size this is the west coast analogue of the Antillean *S. gigas*; the largest specimen of *galeatus* that I have seen is much smaller than the average of the West Indian form; they are entirely unlike in specific characters, such as sculpture, color, etc., the Antillean species far surpassing its west coast relative in beauty of coloring as well as in size. *S. galeatus* is less numerous in the region where it occurs than is *S. gigas* in Antillean waters.

STROMBUS GRANULATUS, Swainson.

Several specimens.

Pichilique Bay; also one fossil example, Santa Margarita Island, *Albatross*.

STROMBUS GRACILIOR, Sowerby.

Three beach shells. Pichilique Bay, *Albatross*.

Family CERITHIIDÆ.

CERITHIUM MACULOSUM, Kiener.

Common.

Tres Marias (No. 32265, U. S. N. M.); La Paz, Fisher, Forrer. Pichilique Bay, Ballenas Bay, and Santa Margarita Island, *Albatross*. Many fine examples with the sculpture prominent, and the knobs sharply pointed. Has a wide geographical range, extending northerly on the outer shore of the peninsula of Lower California, midway to the boundary line of California; thence southerly to Ecuador and the Galápagos Islands. Altata is another locality; (No. 32254, U. S. N. M.)

CERITHIUM STERCUS-MUSCARUM, Valenciennes.

Abundant (No. 32276, U. S. N. M.).

San Lucas Cove and Los Animas, Fisher; La Paz, Forrer. Pichilique Bay, *Albatross*.

CLAVA GEMMATUS, Hinds.

= *Vertagus gemmatus*, HINDS, Carpenter's check list, etc., and authors.

Not infrequent.

Tres Marias (No. 32294, U. S. N. M.), Cape St. Lucas, and La Paz. This form is quite common at Acapulco, where I obtained numerous examples in 1868.

CLAVA (LIOCERITHIUM) INCISUM, Sowerby.

Numerous specimens.

La Paz; San Lucas Cove; Los Animas Bay; Loreto; Angeles Island; Mulege Bay; San Francisquita Bay (No. 32291, U. S. N. M.); Boca de los Piedras, and the Tres Marias; the latter locality somewhat doubtful.

Fisher collected many fine, large specimens of this. When full grown it is a rather rare form. Immature examples are not uncommon in collections, and do not exhibit the special character which indicates *Pyrazus*. Fig. 1895 in Chenu's Manual, Vol. I, is a poor representation of this species. Individuals vary in measurement as follows: Long., .94, lat., .25 inch, with 10 whorls; long., .69, lat., .26 inch, with 8 whorls; long., .50, lat., .20 inch, with 8 whorls.

The short, stumpy fellows suggest another or different species. These have been named *C. curtum* Sby., or *C. euros* Bayle.

CERITHIDEA MAZATLANICA, Carpenter

Common.

La Paz and elsewhere in the Gulf region. Ballenas Bay, abundant, *Albatross*.

CERITHIDEA ALBONODOSA, Carpenter.

Several examples.

San Juanico, and other points on the outer coast of Lower California. Both this and *mazatlanica* may be varieties of the more northern form *sacrata* Gould.

Family MODULIDÆ.

MODULUS CERODES, A. Adams.

Numerous examples. Tres Marias (No. 46953, U. S. N. M.).

This pretty and not very common form is apparently rather numerous at these islands, and at a few other points on the shores of the Gulf; obtained at Pichilique Bay by the *Albatross* collectors. It occurs at the Galapagos Islands.

MODULUS DISCULUS, Philippi.

A few specimens.

Tres Marias (No. 46957, U. S. N. M.), not numerous; the foregoing species appear to be distinct, without connecting varieties. *M. disculus* is by far the more restricted in distribution. It is found also at Mazatlan, Acapulco, and Panama.

MODULUS CATENULATUS, Philippi.

A few examples. Tres Marias. Less common than the others. Occurs at Mazatlan, Guaymas, etc.

Family VERMETIDÆ.

VERMETUS (PETALOCONCHUS) MACROPHRAGMA, Carpenter.

Two specimens. Tres Marias; Los Animas (No. 9502, U. S. N. M.).

VERMETUS (SERPULORBIS) SQUAMIGERUS, Carpenter.

Two specimens.

Sta. Margarita Island (No. 102398, U. S. N. M.), and at Pichilique Island (No. 117971, U. S. N. M.), *Albatross*.

VERMETUS (SERPULORBIS) PELLUCIDUS, Broderip and Sowerby.

One example. Pichilique Bay, *Albatross*, on *Pecten subnodosus*.

VERMETUS (SERPULORBIS) PELLUCIDUS, Broderip and Sowerby.
Var. = *eburneus*, REEVE.

Station 2828, 10 fathoms, off Lower California, attached to *Spondylus princeps*; *Albatross*.

BIVONIA COMPACTA, Carpenter. (?)

Examples. Sta. Margarita Island, *Albatross*.

Family TURRITELLIDÆ.

TURRITELLA GONIOSTOMA, Valenciennes.

Several examples.

San Josef Island (No. 9485, U. S. N. M.); San Juanico; also at La Paz, Capt. Forrer.

TURRITELLA TIGRINA, Kiener.

Two examples. San Juanico; Altata (No. 9472, U. S. N. M.).

Family LITTORINIDÆ.

LITTORINA ASPERA, Philippi.

Abundant. Santa Maria Bay (No. 46963, U. S. N. M.).

The specimens from this locality are numerous, typical, and fine; many of them strong, heavy shells.

LITTORINA CONSPERSA, Philippi.

Numerous examples.

Santa Maria Bay; Tres Marias (No. 47001, U. S. N. M.). Not common at the first place, but abundant at the latter. A variety, apparently of this species, occurs at Payta, South America.

Family SOLARIIDÆ.

SOLARIUM GRANULATUM, Lamarck.

Three examples.

La Paz (Nos. 46293, 42694, U. S. N. M.); also at Loreto and Magdalena Bay (No. 46307, U. S. N. M.).

TORINIA VARIEGATA, Lamarck.

A few specimens.

Port Escondido; Boca de los Piedras; Tres Marias (No. 46299, U. S. N. M.). La Paz, Forrer.

Family CALYPTREIDÆ.

CRUCIBULUM IMBRICATUM, Sowerby.

Not uncommon.

Tres Marias (Nos. 60241, 60245, U. S. N. M.); Santa Margarita

Island, common on beach, *Albatross*; San Juanico; Galapagos Islands, and coasts of Ecuador and Peru.

A dark brown specimen of this fine species, 0.80 inch in length from the first locality. The collection contains examples which measure 2.39 inches long. In such large specimens the sculpture is very strong and the somewhat irregular radiating ribs are proportionately more conspicuous than in small specimens; in the latter, however, the details of the finer, wrinkled sculpture are more distinct. A great number of synonyms have been made that I will not here repeat, but refer to Carpenter's Mazatlan Catalogue, p. 287, and to my paper on the Galapagos (*Albatross*) shells, in the Proceedings, U. S. National Museum, 1893, Vol. XVI, 398 *et seq.*

CRUCIBULUM SPINOSUM, Sowerby.

Common (No. 60229, U. S. N. M.).

Tres Marias; Loreto; common everywhere. Santa Margarita Island, common on beach, *Albatross*. From Monterey, Cal., to Peru, and in the Galapagos Islands this species is found; it is a generally and widely distributed form.

CREPIDULA UNGUIFORMIS, Lamarck.

Common.

Tres Marias (No. 12485, U. S. N. M.); La Paz (No. 12497, U. S. N. M.); Captain Forrer.

Particularly fine examples from the inside of the mouth of *Oliva renulata*.

CREPIDULA DORSATA, Brod.; var. LIGULATA, Gould.

One example. Tres Marias (No. 60259, U. S. N. M.); frequent in the Gulf at many places.

CREPIDULA RUGOSA, Nuttall-Reeve.

Two specimens. Altata (No. 12496, U. S. N. M.). The above is obviously a varietal aspect of Sowerby's *Crepidula onyx*.

GALERUS MAMILLARIS, Broderip.

One example from each place.

Tres Marias (No. 60253, U. S. N. M.); Altata (No. 60255, U. S. N. M.). Recently detected at Long Beach, on the coast of Los Angeles County, Cal.

Family AMALTHEIDÆ.

AMALTHEA BARBATA, Sowerby.

Two specimens.

Tres Marias (No. 32566, U. S. N. M.). Occurs also at the Galapagos Islands and on the coast of Ecuador.

AMALTHEA SERRATA, Carpenter.

Four examples. Tres Marias (No. 32575, U. S. N. M.).

Ranges northerly along the coast of California proper, and southerly to (?) Panama.

Family NATICIDÆ.

NATICA CATENATA, Philippi.

Five specimens. Gulf of California (No. 46435, U. S. N. M.).

NATICA CHEMNITZII, Pfeiffer.

Eight specimens. Mazatlan, common in many places.

NATICA EXCAVATA, Carpenter.

One specimen, beach. Tres Marias (No. 46346, U. S. N. M.). This is a decidedly rare species.

NATICA ZONARIA, Recluz.

Several examples living. Tres Marias (No. 46443, U. S. N. M.); Carmen Island (No. 46441, U. S. N. M.).

NATICA PRITCHARDI, Forbes.

Numerous specimens.

La Paz; San Lucas Cove; Los Animas; Angeles Island; Boca de los Piedras; Tres Marias; Loreto, etc. A widely distributed form. Carpenter has included under the name of "*maroccana* Chemnitz," the above, as well as *N. unifasciata* Lamarek and *zonaria* Recluz. It is probably true that these are all varieties of one and the same species, but it is a matter of uncertainty as to which of these specific names was first applied to West American shells. *N. maroccana* is credited to the Galapagos Islands.

POLYNICES BIFASCIATA, Gray

Numerous specimens.

La Paz; San Lucas Cove, opposite Marcos Island (Nos. 46453, 46454, U. S. N. M.); Pichilique Bay, *Albatross*.

Mr. Fisher reported the above as common at La Paz. A fine species, not always *bifasciate*. Occasionally the space between the usual bands on the latter part of the body whorl is filled in with white, thus uniting and forming a single broad band.

POLYNICES UBER, Valenciennes

Common, living and on the beaches.

Mulege Bay (No. 46436, U. S. N. M.); La Paz (No. 46461, U. S. N. M.);

Boca de los Piedras (No. 46459, U. S. N. M.); Loreto; Panama; Payta; Manta; Galapagos Islands. It has a more northerly distribution than herein given.

POLYNICES (LUNATIA) OTIS, Broderip and Sowerby.

Several examples.

Boca de los Piedras (No. 46546, U. S. N. M.); La Paz; Tres Marias; Payta, Peru; Galapagos Islands. At the latter a variety is found which has received the name of *galapagosa*, Recluz, it is pretty close to if not absolutely the same as the following.

POLYNICES (LUNATIA) OTIS, var.=FUSCA, Carpenter.

One specimen at each place Tres Marias (No. 46547, U. S. N. M.); Acapulco (No. 46545, U. S. N. M.). The first example somewhat the worse for the rubbing it got in the surf, resembles the Indo-Pacific form "*N. somia* Chemnitz, New Zealand and Viti Islands," etc., so closely that Tryon thought it was that species. It does not approach very closely to *somia*, but the importance of an extensive geographical and varietal series was seen in this case, as well as hundreds of others, for it enabled us to connect it without trouble with its geographical congeners. It is with barely a doubt the variety to which Dr. Carpenter gave the name of "*fusca*."

POLYNICES (NEVERITA) RECLUZIANA, Reeve.

Two examples from each of the following places:

La Paz (No. 46533, U. S. N. M.); Tres Marias (No. 46535, U. S. N. M.); Boca de los Piedras (No. 75000, U. S. N. M.); San Juanico; Loreto; and elsewhere northerly and to the south. Pichilingue Bay, also fossil on Cerros Island, *Albatross*.

SIGARETUS DEBILIS, Gould.

Infrequent.

La Paz, living (No. 46555, U. S. N. M.); Altata (No. 46553, U. S. N. M.). The nucleus, nuclear whorls, and general aspect of this species is very much like *S. perspectiva* Say of the Florida region.

Superfamily DOCOGLOSSA.

Family ACMÆIDÆ.

ACMÆA DALLIANA, Pilsbry

Mannel Conch., Vol. XIII, p. 13, Pl. VII, figs. 57-60.

Several examples (No. 32614, U. S. N. M.).

Angel Island, Pt. Refugio; also at (?) San Francisquita Bay and (?) Los Animas Bay. Chief examples measured 2.15 long, 1.55 lat. milli-

meters. Sculpture closely resembling that of *A. scabra* Nutt.-Rve., which also occurs in the Gulf region. The above is much longer in proportion to breadth, more ovate and flatter than *scabra* of same size, and the apex is less central than in the latter species.

It may prove to be an extreme varietal aspect of *scabra*.

ACMÆA PATINA, Eschscholtz.

Two juniors.

These are the young of a common varietal aspect of *patina* and were detected at Santa Margarita Island (No. 102523, U. S. N. M.), *Albatross*

ACMÆA ASMI, Middendorff.

Common living. Ballenas Bay, *Albatross*.

The above three species may be regarded as northern forms and their southerly limit is probably in this vicinity. So too with *Lottia gigantea*, referred to below.

The following species of the group may on the other hand be considered as more southerly forms and their northerly limit, in a general way in this region.

ACMÆA PEDICULUS, Philippi.

One example. Tres Marias (No. 32612, U. S. N. M.).

ACMÆA FASCICULARIS, Menke.

Several specimens. Tres Marias (No. 32664, U. S. N. M.); Loreto.

ACMÆA DISCORS, Philippi.

Abundant. Tres Marias (No. 32628, U. S. N. M.); San Bruno, Gabb (No. 32645, U. S. N. M.).

ACMÆA ATRATA, Carpenter.

Two specimens.

Tres Marias (No. 32649, U. S. N. M.); one adult and one junior. Acapulco Dall (No. 59671, U. S. N. M.); Cape St. Lucas (No. 59666, U. S. N. M.).

LOTTIA GIGANTEA, Gray.

One beach shell. Ballenas Bay, *Albatross*.

SCURRIA MESOLEUCA, Menke.

Three specimens. Tres Marias (No. 32664, U. S. N. M.).

SCURRIA MESOLEUCA, Menke; var.? = ACMÆA VESPERTINA, Reeve.

Two examples.

Tres Marias (No. 32629, U. S. N. M.); Ventosa Bay, Tehuantepec

(No. 60443, U. S. N. M.), *Sumichrasti*. Common in many places, and more highly colored than is usual with *mesoleuca*.

Family PATELLIDÆ.

PATELLA MEXICANA, Broderip and Sowerby.

One example at each place. *Altata* (No. 47189, U. S. N. M.), *Tres Marias* (No. 75002, U. S. N. M.).

Superfamily RHIPIDOGLOSSA.

Family PHASIANELLIDÆ.

PHASIANELLA PERFORATA, Philippi.

One specimen. *Tres Marias* (No. 55440, U. S. N. M.).

Family TURBINIDÆ.

TURBO (SENECTUS) SQUAMIGER, Reeve.

Two specimens. *Tres Marias* (No. 59908, U. S. N. M.).

The geographical range of the above extends southerly to Ecuador and Peru, and it is said to occur at the Galapagos Islands. It is a rare species.

TURBO (CALLOPOMA) FLUCTUOSUS, Wood.

= *T. fluctuatus*, REEVE; + *T. Moltkianus*; = *T. Fokkesi*, JONAS; = *T. assimilis*, KIENER, + *T. tessellatus*, KIENER; ? = *T. depressus*, CARPENTER; ? = *T. funiculosus*, KIENER, CARPENTER.

Numerous young specimens.

Tres Marias (No. 59905, U. S. N. M.), *Point Escondido* and *St. Josef Island*. This species was collected by the *Albatross* naturalists at *Pichilique Bay* (beach), at *Santa Margarita Island*, where it was found to be abundant, both the simple corded form as well as the strongly sculptured and nodose variety; also at *Ballenas Bay*.

Dr. Jones collected the above species on the coasts of Ecuador and Peru.

ASTRALIUM (UVANILLA) INERMIS, Gmelin.

One example.

Point San Quentin (No. 59910, U. S. N. M.). The most northerly point at which this form has been detected.

ASTRALIUM (UVANILLA) REGINA, Stearns.

One specimen, living.

Guadalupe Island (No. 135314, U. S. N. M.), *Capt. George D. Porter*. A beautiful and characteristic species.*

POMAULEX UNDOSUS, Wood.

Not uncommon.

* Preliminary description in "The Nautilus," 1892. Described and figured in the *Proc. U. S. Nat. Mus.*, Vol. XVI, 1893, p. 350.

Ballenas Bay (one junior) and Cerros Island 2 fossil examples *Albatross*. Common in the vicinity of San Diego and San Pedro, as well as on Catalina Island.

Family TROCHIDÆ.

CHLOROSTOMA GALLINA, Forbes.

Three examples. Tres Marias (No. 60040, U. S. N. M.).

The above are young specimens, about one-third mature size.

Also detected at Santa Margarita Island and Ballenas Bay, *Albatross*. An abundant form on Catalina Island and elsewhere at more northerly localities on the mainland.

CHLOROSTOMA GALLINA, var. MULTIFILOSA, Stearns.

One example, living.

Guadalupe Island (No. 125315, U. S. N. M.). A fine large form;* entire surface covered with close-set, rather coarse thread-like ridges, that follow the whorls spirally.

CHLOROSTOMA (OMPHALIUS) GLOBULUS, Carpenter.

Abundant. Tres Marias; Point Escondido; St. Josef Island.

Particularly numerous at the Tres Marias. Shell rather flattish when young; transversely finely ribbed; middle portion of whorls somewhat angulated and in some instances carinated, the upper edge of angle or keel broken into roundish nodules. Umbilicus open, large, generally stained with a bright green, otherwise color variable; in this latter respect like *Gibbula varians* Phil., or *Omphalius canaliculatus* Lam., from Europe.

CHLOROSTOMA (OMPHALIUS) FUSCESCENS, Philippi.

Two examples.

San Juanico. Common at Catalina Island and elsewhere along the mainland to the north.

The above is probably the *ligulatum* of Menke, a varietal aspect of *viridulum*.

CHLOROSTOMA (OMPHALIUS) AUREOTINCTUM, Forbes.

Several specimens.

Santa Margarita Island and Ballenas Bay, *Albatross*. Common on Catalina Island.

CALLIOSTOMA VERSICOLOR, Menke.

Living specimens.

*Described and figured in Vol. XVI, Proc. U. S. Nat. Mus., 1893, p. 351. Preliminary description in "The Nautilus," 1892.

Boca de los Piedras (No. 32505, U. S. N. M.); Cape St. Lucas (No. 32506, U. S. N. M.), and elsewhere in the Gulf region.

Family *NERITIDÆ*.

NERITA SCABRICOSTA, Lamarck

Several examples.

Pichilique Bay; Santa Margarita Island, *Albatross*; Common also at the Galapagos Islands. Often of very large size; varies much in elevation.

NERITA BERNHARDI, Recluz.

Abundant.

Tres Marias; also Mulege Bay (Nos. 32702, 60337, U. S. N. M.), where it is exceedingly numerous; also at Pichilique Bay, Ballenas Bay, and Margarita Island, *Albatross*. Common at Panama.

NERITINA PICTA, Sowerby.

Common.

La Paz; Loreto, and elsewhere in the Gulf; frequently exhibits very beautiful color varieties; extends up the outer coast of Lower California, and south to Panama and beyond. Pichilique Bay, *Albatross*.

Superfamily *ZYGOMBRANCHIATA*.

Family *FISSURELLIDÆ*.

FISSURELLA NIGROCINCTA, Carpenter.

One example. Gulf of California (No. 59241, U. S. N. M.).

FISSURELLA VOLCANO, Reeve.

= *F. ornata*, NUTTALL.

Abundant.

Tres Marias (No. 48166, U. S. N. M.). San Juanico, Gabb (No. 48165, U. S. N. M.); Ballenas Bay, *Albatross*; Ventosa Bay, Tehuantepec, Sumichrast (No. 60440, U. S. N. M.). Though darker colored than the more northerly Monterey specimens of *F. volcano*, which are nearly white inside and show more or less of a reddish or pinkish color externally, I regard the specimens from the two localities as belonging to the same species. Specimens in the collection from intermediate points seem to connect them.

FISSURIDEA MURINA, Carpenter.

Several examples.

Tres Marias; La Paz, Forrer. Not uncommon elsewhere in and around the Gulf.

[This is the *Glyphis densiclathrata* of Californian conchologists, but not of Reeve; *G. saturnalis* of Pilsbry (Nautilus, v., p. 105), not of Carpenter, and *G. densiclathrata* var. *murina* of Carpenter.—W. H. D.]*

FISSURIDEA INÆQUALIS, Sowerby.

= *Glyphis inæqualis*, SOWERBY.

Frequent.

Tres Marias (Maria Madre), numerous, Fisher (No. 48191, U. S. N. M.); La Paz, Fisher, and Forrer.

FISSURIDEA INÆQUALIS.

Var. = *PICA*, Sowerby.

One example. Tres Marias (No. 48190, U. S. N. M.).

FISSURIDEA ALTA, C. B. Adams.

= *Glyphis alta*, C. B. ADAMS.

Five specimens. Tres Marias (No. 48195, U. S. N. M.); also Panama, Bridges (No. 48194, U. S. N. M.).

Superfamily EOPLACOPHORA.

Family ISCHNOCHITONIDÆ.

ISCHNOCHITON CLATHRATUS, Reeve.

= *Lepidopleurus pectinulatus*, CARPENTER, Mss. and of authors.

Numerous examples.

Assuncion Island (No. 58852, U. S. N. M.); Todos Santos Bay, Hemphill (No. 58779, U. S. N. M.); Lower California (Nos. 58805, 125596, U. S. N. M.). Besides the above the collection has been enriched by a fine series of this species from Mr. Hemphill, who collected them along the ocean shore of the peninsula.

ISCHNOCHITON MACANDREI, Carpenter.

= *C. muscarius*, REEVE, *vide* CARPENTER.

One specimen, imperfect.

Mazatlan (No. 58879, U. S. N. M.). The foregoing was determined by Carpenter; it is quite rare in collections.

ISCHNOCHITON (STENORADSIA) ACRIOR, Carpenter.

Six examples.

San Juanico (No. 58710, U. S. N. M.), also same place (No. 58750, U. S.

* Dall in Proc. U. S. Nat. Museum, Vol. XIV, p. 197-198.

N. M.); the first collected by the late Dr. Gabb in 1867, the last by Mr. Fisher, who also collected it in Magdalena Bay (No. 58845, U. S. N. M.). The National Museum contains, in addition to the foregoing, a very fine series collected by Mr. Henry Hemphill on the outer coast of Lower California.

PALLOCHITON LANUGINOSUS, Carpenter.

Two examples. Loreto (No. 58863, U. S. N. M.) Gabb.

CHELOPLEURA BEANII, Carpenter.

One example.

Mazatlan (No. 58874, U. S. N. M.), off of *Patella mexicana*; it was determined by Dr. Carpenter.

Family LOPHYRIDÆ.

CHITON ALBOLINEATUS, Sowerby.

Several examples.

Mazatlan (No. 59230, U. S. N. M.), collected by Henry Edwards; also three specimens Stearns collection (No. 58765, U. S. N. M.), Todos Santos Bay, Lower California.

A very distinct and beautiful species. Reported also from Acapulco. This species shows considerable variation in color markings, some plates being unicolored, others on the same individuals beautifully picked out with white.

Superfamily OPSICHITONIA.

Family MOPALIIDÆ.

ACANTHOCHITES EXQUISITUS, Pilsbry.

Several examples.

Los Animas Bay (No. 58826, U. S. N. M.) very large specimens (Nos. 58874, 58829, and 58828, U. S. N. M.). A fine series of these extraordinary forms all from the same locality, of a delicate lightish sea-green; a beautiful variety of a pale salmon-color or reddish-buff is illustrated by one example (No. 58830, U. S. N. M.); the branches or tufts of long fibrous spiculæ resemble spun glass. This remarkable form is rarely met with in collections and its exact habitat has heretofore been uncertain. Pichilinque Bay, one example on *Margaritiphora fimbriata*, *Albatross*.

To facilitate reference, the species above listed as occurring at the Tres Marias Islands have been brought together on p. 203.

MOLLUSKS OF THE TRES MARIAS ISLANDS.

1. *Mytilus multiformis*, Cpr.
2. *Byssosarca mutabilis*, Sby.
3. *Venericardia flammea*, Mich.
4. *Cardita crassa*, Gray.
5. *Chione undatella*, Sby.
6. *Psammobia regularis*, Cpr.
7. *Orthalicus undatus*, Brug.
8. *O. undatus* var. = ? *O. melanocheilus*, Val.
9. *Siphonaria lecanium*, Phil.
10. *Conus Dalli*, Stearns.
11. *Conus vittatus*, Lam.
12. *Conus purpurascens*, Brod.
13. *Conus gladiator*, Brod.
14. *Conus brunneus*, Wood.
15. *Conus brunneus* var. = *tiaratus*, Brod.
16. *Conus nux*, Brod.
17. *Oliva venulata*, Lam.
18. *Oliva splendidula*, Sby.
19. *Olivella cyanea* Reeve, var.
20. *Harpa crenata*, Rumph.
21. *Solenosteira modificata*, Rve.
22. *Mitra lens*, Wood.
23. *Leucozonia cingulata*, Lam.
24. *Latirus ceratus*, Wood.
25. *Nassa corpulenta*, C. B. Ad.
26. *Nassa luteostoma*, Brod and Sby.
27. *Columbella fuscata*, Sby.
28. *Anachis coronata*, Sby.
29. *Nitidella cribraria*, Lam.
30. *Meta cedonulli*, Rve.
31. *Strombina maculosa*, Sby.
32. *Chicoreus palma-rosæ mexicana*, Stearns.
33. *Purpura patula*, Linnaeus.
34. *Purpura columellaris*, Lam.
35. *Monoceras tuberculatum*, Gray.
36. *Monoceras lugubris*, Sby.
37. *Rhizochilus, nux*, Rve.
38. *Triton vestitum*, Hds.
39. *Cassis vibex-mexicana*, Stearns.
40. *Levenia coarctata*, Sby.
41. *Oniscidia tuberculosa*, Rve.
42. *Cypræa isabella-mexicana*, Stearns.
43. *Cypræa albuginosa*, Mawe.
44. *Cypræa arabicula*, Lam.
45. *Trivia sanguinea*, Gray.
46. *Trivia radians*, Lam.
47. *Trivia pulla*, Gask.
48. *Pustularia pustulata*, Lam.
49. *Strombus galeatus*, Wood.
50. *Cerithium maculosum*, Kien.
51. *Cerithium incisum*, Sby.
52. *Clava gemmata*, Hinds.
53. *Modulus cerodes*, A. Ad.
54. *Modulus disculus*, Phil.
55. *Modulus catenulatus*, Phil.
56. *Petalocochnus macrophragma*, Cpr.
57. *Littorina conspersa*, Phil.
58. *Torinia variegata*, Lam.
59. *Crucibulum imbricatum*, Sby.
60. *Crucibulum spinosum*, Sby.
61. *Crepidula unguiformis*, Lam.
62. *Crepidula dorsata* var. *ligulata*, Ged.
63. *Galerus mamillaris*, Brod.
64. *Amalthea barbata*, Sby.
65. *Amalthea serrata*, Cpr.
66. *Natica excavata*, Cpr.
67. *Natica zonaria*, Cpr.
68. *Natica Pritchardi*, Fbs.
69. *Lunatia otis*, Brod and Sby.
70. *Lunatia otis* var. *fusca*, Cpr.
71. *Neverita Recluziana*, Rve.
72. *Acmæa pediculus*, Phil.
73. *Acmæa fascicularis*, Mke.
74. *Acmæa discors*, Phil.
75. *Acmæa atrata*, Cpr.
76. *Scurria mesoleuca*, Mke.
77. *Scurria mesoleuca* var. ? = *vespertina*, Rve.
78. *Patella Mexicana*, Brod and Sby.
79. *Phasianella perforata*, Phil.
80. *Senectus squamiger*, Rve.
81. *Callopoma fluctuosus*, Wood.
82. *Chlorostoma gallina*, Fbs.
83. *Omphalius globulus*, Cpr.
84. *Nerita Bernhardi*, Recluz.
85. *Fissurella volcano*, Rve.
86. *Fissuridea murina*, Cpr.
87. *Fissuridea inaequalis*, Sby.
88. *Fissuridea inaequalis* var. *pica*, Sby.
89. *Fissuridea alta*, C. B. Ad.

It will be seen that the foregoing segregation includes 89 species and varieties of the 294 contained in the general catalogue. The island list is apparently small compared with the latter, and still smaller when compared with the number of species known to exist in the Mazatlan and Panama province. It should, however, be borne in mind that no special effort was made to investigate the Mollusk fauna of the Tres Marias and that the species collected in this little group of islands

were incidentally obtained, or the random collections made, during a very brief stay. Some of the forms are quite rare; these, together with the probability of obtaining other equally rare and desirable species, and the presumption that by systematic search a very large addition may be made to the number now known as occurring, offer a promising return to whoever will make a thorough exploration of these islands.

The following papers, published chiefly in the *Proceedings* of the U. S. National Museum, will be found to contain more or less information relating to the distribution of the species above recorded, as well as to many others that occur on the west coast between Point Conception, California, and the South American coast as far south as $7^{\circ} 30' S$:

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 List of North American land and fresh-water shells received from the U. S. Department of Agriculture, etc.
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Proc. U. S. Nat. Mus., XIV, pp. 307-335, 1891. (No. 851.)
 Preliminary report on the molluscan species collected by the United States expedition to West Africa in 1889-'90.
Proc. U. S. Nat. Mus., XVI, pp. 317-339, 1893. (No. 940.)
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Proc. U. S. Nat. Mus., XVI, pp. 341-352, 1893. (No. 941.)
 Report on the mollusk fauna of the Galapagos Islands, with descriptions of new species.
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